



INDIAN SCIENCE CONGRESS HANDBOOK

*'For wee are borne to quest and seeke
after trueth; to possess it belongs to a
greater power.'*—Florio's *'Montaigne.'*

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PREFACE

THIS handbook has been prepared for the use of members attending the sixteenth annual meeting of the Indian Science Congress to be held at Madras from January 2nd to 8th, 1929.

Nothing in the nature of a complete or comprehensive guide has been aimed at. A series of articles has been collected on subjects which, it is thought, would, specially, interest the members and which they would be able to read at a time when they are likely to have more leisure than during their actual sojourn in Madras.

The Indian Science Congress had its first meeting in 1914 under the auspices of a committee of the Asiatic Society of Bengal who arranged the first meeting held in Calcutta in that year. The Science Congress weathered the period of the Great War and has grown steadily ever since in its influence in stimulating scientific research in India. Like the British Association for the Advancement of Science, on

which in its small beginnings the Science Congress has been modelled, its aims are threefold :—(i) to furnish opportunities for scientific workers to get in touch with those working on allied subjects ; (ii) to encourage research ; (iii) to make scientific knowledge accessible to the general public.

A. F. MACCULLOCH.

CONTENTS

PAGE

PREFACE	iii
A SHORT SKETCH OF THE ANCIENT HISTORY OF SOUTH INDIA. By Rao Sahib S. Krishna- swami Aiyengar, M.A., Ph.D., Professor of Indian History, Madras University ...	1
THE CITY OF MADRAS. By P. C. Dutt, Esq., I.C.S., Collector of Madras ...	34
MADRAS CITY ARCHITECTURE. By R. Dann, Esq., Director of Town Planning, Madras ...	48
ST. MARY'S CHURCH, FORT ST. GEORGE, MADRAS. By E. J. Bingle, Esq., Madras Christian College	79
GOVERNMENT MUSEUM, CONNEMARA PUBLIC LIBRARY AND ORIENTAL MANUSCRIPTS LIBRARY. By F. H. Gravely, Esq., D.Sc., Curator of the Museum	89
THE VICTORIA TECHNICAL INSTITUTE. By F. H. Gravely, Esq., D.Sc.	92
MAHABALIPURAM OR SEVEN PAGODAS. By F. H. Gravely, Esq., D.Sc.	96
THE TEMPLES OF CONJEEVARAM. By F. H. Gravely, Esq., D.Sc.	104
INDIAN INSTITUTE OF SCIENCE, BANGALORE. By M. O. Forster, Esq., Ph.D., F.I.C., F.R.S., Director of the Institute	112
THE VEGETATION OF MADRAS. By P. F. Fyson, Esq., B.A., F.L.S., Principal, Presidency College, Madras and M.R.Ry. M. O. Parthasarathy Aiyengar, M.A., L.T., Professor of Botany, Presidency College, Madras	126

THE GEOLOGICAL STRUCTURE OF THE MADRAS PRESIDENCY WITH A SHORT NOTE ON PLACES OF GEOLOGICAL INTEREST AROUND MADRAS. By M.R.Ry. C. K. Krishnaswami Pillai, M.A., L.T., M.SC., Professor of Geology, Presidency College, Madras	134
THE AGRICULTURAL COLLEGE AND RESEARCH INSTITUTE, COIMBATORE. By R. D. Anstead, Esq., M.A., C.I.E., Director of Agriculture, Madras	154
SOME ANTHROPOLOGICAL PROBLEMS. By A. S. Woodburne, Esq., Ph.D., Madras Christian College	165
THE KING INSTITUTE OF PREVENTIVE MEDICINE. By Lieut.-Colonel H. H. King, I.M.S., Director of the Institute	179
MEDICAL EDUCATION IN THE MADRAS PRESIDENCY FROM 1835 TO 1928. By Lieut.-Colonel C. A. F. Hingston, C.I.E., O.B.E., I.M.S., Super- intendent, Government Maternity Hospital, Madras	186
WOMEN'S EDUCATION IN MADRAS. By Miss I. H. Lowe, Deputy Directress of Public Instruction, Madras	215
THE PRESENT STATUS OF PSYCHOLOGY. By A. S. Woodburne, Esq., Ph.D., Madras Christian College	231

A SHORT SKETCH OF THE ANCIENT HISTORY OF SOUTH INDIA

THE history of South India may be said to begin with the beginning of the Christian era as far as the material for that history of a South Indian character is concerned. For historical knowledge of the South Indian region, we can go back a number of centuries, five, six or seven, according to opinion, if the information is based on a knowledge of South India as incorporated in Sanskrit literature. Almost from the days of the Brahmanas the horizon of the Aryan vision in the south extends till in the age of the Mauryas, we may say that the Indian-Aryans had a knowledge of the whole of South India. Megasthenes has reference to the Pandya country and its having been under a woman ruler. There are numerous references to what is now Berar, that is, to the whole of the Nizam's Dominions, as a forest region, and ultimately to a knowledge of Kanchi as a

centre of importance for Sanskrit learning, and even to the country of Kerala, as we come down the stream of time through the grammarian, Panini, and his contemporaries, Katyayana and Patanjali, so that when we come to the beginning of the Christian era, knowledge of South India among the northerners may be regarded as almost complete. But actual knowledge of South India from monuments of various kinds goes back centuries, it may be millenniums, on the basis of archaeological and ethnological material. Such remains as have come down to us take us to neolithic times and even to paleolithic times to some considerable extent, so that the theory has been propounded that the Dekhan part of South India was the home of man. Without attempting to go into this period in any detail, we may come on to the really historical period beginning with the age of the Mauryas in the north. We have references during the time to the kingdom of Kalinga, to the existence of the territory of the Andhras, to the kingdom of the Asmakas on the Godavari in the west, coming down southwards to even the viceroyalty of Asoka at Suvarnagiri,

which may be safely located somewhere near Maski in the south-west corner of the Nizam's Dominions. Asoka's authority extended to as far as the frontier of Mysore and came into diplomatic touch with the three-crowned kings of the south, the Chera, Chola, Pandya, and even a fourth further north, the Satiyapura. There is also some information to hand in the earliest pieces of Tamil literature of an invasion of Tamil India by the Mauryas and of its being kept back by the effort of the Tamils.

So far, however, as South Indian material for history goes, the earliest extant literary material is what goes by the collective name of Sangam works, ascribable, on satisfactory grounds, to the first or second century of the Christian era. In the centuries on either side of the Christian era, there has been such a considerable amount of fermentation and growth, which introduces us immediately to an age of luxuriant culture of Tamil literature. Tamil seems to have attained to a certain amount of growth and development as a language, and had sufficient natural vigour for further growth, and as far as one could judge from extant literature,

it seems to have required the contact of Sanskrit to acquire new vigour and exhibit that growth, which we see in the Sangam literature, such as the extraordinarily quick growth that one obtains by the horticultural process of grafting. That seems the only way of accounting for the sudden appearance, as it were, of an age which may cover a number of centuries, of the fullest efflorescence of Tamil literature.

In these early days, Tamil India was marked off as a distinct entity. To the north of it was the region of the *Vaḍuḥar*, according to those known in the two branches, to Telugu *Vaḍuḥar* on the north-eastern frontier extending inwards from the sea to almost Adoni, and to the Kannaḍa *Vaḍuḥar* extending inwards from there to almost the Western Ghats with a *Vaḍuharmunai*, the frontier post of these *Vaḍuḥar* in each of these, the first at Tirupati and the second in the region of Molkalmuru in the north-eastern corner of Mysore, where the Asokan Edicts are found. The region along the coast stretching further west, perhaps might have been even beyond, was known among the Tamils by the name *Koṇ-Kānam*,

the modern Konkan'. Beyond this was the indefinite region of forest, which the Tamils called *Dandaranyam*, the equivalent of the Sanskrit *Dandakaranyam*. This is what is described by the classical writer, Pliny, the author of the *Periplus* and Ptolemy, as the region of the forest. Beyond that were the kingdoms known as the *Asmaka*, the Andhra and Kalinga. We have reference to a king who ruled in a considerable part of what was the *Dandaka* forest, and Sanskrit literature has it that it became an inhospitable forest because of the iniquities of a ruler who brought on this calamity on the land that he ruled. That is the earliest glimpse that we get of South India, in the south of the Vindhya. Before this period, the information that the northerner had of the south was the vague southern road, *Dakṣiṇāpatha* as opposed to the northern road, *Uttarāpatha*. From that vague beginning, knowledge widens till in the middle of the second century B.C. Patanjali knew the utmost south.

The Aryan penetration of this region seems to have been a gradually expanding slow process. When we come to the age of the Mauryas

and, specifically, the Mauryan Empire of Asoka, we find that his authority stopped short at the northern frontier indicated above, the *Vaḍuhar-munai*, the frontier post of the *Vaḍuhar*. While his authority stopped short with that line, he claims that his influence penetrated into the territory of his neighbours in this part, as he claims that his influence prevailed in the west among the territories of his Greek neighbours of Asia, Europe and Africa. Even in the distant Tamil south, settlements of Brahmans, Buddhists and Jains had become general, while the royal propaganda backed by official authority stopped short there. So much is stated clearly by Asoka himself. When the empire of Asoka broke up and the region of South India under him passed into the hands of the Andhras, the power more than any other which was responsible for the disruption of his empire, these Andhras ruled for about thirty generations, according to the Puranas, and for a period of five centuries and more. Their rule had been patterned on that of the Mauryan empire, and they seem to have shown themselves pretty early votaries of Aryan culture,

so that up to the frontier indicated the country had become thoroughly Aryanised. Across this frontier into the farther south, the process of Aryanisation was perhaps not quite so thorough, but it was, none the less, very important and fruitful. It seems to be this contact that made Tamil get into full blossom and fructify into that vast body of literature generally known as the Sangam literature, which gives us the first real insight into the history of South India. During the period of the Andhra domination in the Dekhan, South India seems to have been independent and powerful and equally prosperous with the region of the Andhras. The glimpse that we get of this region from foreign writers, such as we have already referred to, is amply confirmed by what we can learn of it from the indigenous Tamil literature. The era was one of great prosperity and commercial activity both external and internal. There were orderly Government and established authority to permit, peacefully, of the prosecution of this trade within and commerce across. The Tamil region was divided into three kingdoms, Chola, Pandya and Chera, and a certain number of chieftancies

varying according to time from five to fourteen. The fertile coastal region of the Kaveri delta extending a considerable distance north and south constituted the Chola kingdom; the region beginning with Vellar running near the town of Pudukotta extending southwards to Cape Comorin and from sea to sea was the Pandya kingdom. The west coast north of Kottayam extending almost up to Cannanore along the coast was the Chera kingdom. The territory in between extending from the frontiers of the Chola kingdom to the foreign frontier of the *Vaduhar* was distributed among the chiefs, some of whom had their territories within the kingdoms of these kings. Divided as it was in this fashion, and conducting wars pretty frequently, as we have evidence, it seemed still to have enjoyed a very considerable amount of peace and plenty with all the necessities of a well-ordered life for the people assured to them. When we emerge from this, just at the period when the empire of the Andhras passes out of existence by an inanition followed by dismemberment about the middle of the third century, we find some kind of cataclysm coming

over the south as well. The kingdoms and their prosperity pass into an eclipse and we almost lose sight of what was exactly the state of things.

All this darkness seems to have been caused as a consequence of the cessation of the Andhra empire in the Dekhan. That, in its turn, seems to have been more or less due to its own natural decline aided by foreign invasions both from the north and from the west under the Sakas and others. The Andhra viceroys of the south-eastern frontier seem to have showed enterprise and pushed themselves southward and took into their territory the region dependent upon Kanchi, which continued to be a Chola viceroyalty even when it was under a Tondaman chieftain. The advent of this new power into Kanchi seems to have dislocated the people, Kaḷavar inhabiting the region of Vellore, and the North Arcot District in part, and it is their movement as a tribal movement that seems to have upset the territory of Kanchi first, the Chola kingdom next and even the Pandya kingdom afterwards. This seems to be what is actually referred to as the coming of the Kaḷabhras in the later Velvikūḍi charters of the

Pandyas. This introduces a period of about two centuries of confusion, during which the Pallava interlopers were able to occupy the territory of Kanchi and consolidate a kingdom of their own there. It was almost about the same time that the Pandyas after an eclipse re-emerge into light. The eclipse in regard to the Cholas seems to have continued. The territory having been divided among a certain number of Kalavar chieftains of whom we seem to hear of one family ruling in Puhar, or Kaveripattinam, one capital of the Cholas, another somewhere near Tanjore, almost at Tanjore itself, and a third in the State of Pudukottah at a place called Kōḍumbālūr. It is by defeating one of these Tanjore chiefs that the later Chola dynasty established itself. When, about the commencement of the seventh century, the Pallavas had established themselves masters in Kanchi, and the Pandyas restored themselves to some considerable extent in their own territory, there sprang into view, simultaneously, a new power in the region of the Andhras. That territory, having been appropriated by a number of subordinate ruling

families under the Andhras, passed by quick transition into the possession of an important and influential dynasty known to history as that of the Vākāṭakas of Berar. These were the exact contemporaries of the great Gupta dynasty of Hindustan, and like that dynasty, these came to an end about the middle of the sixth century, and, giving place to a number of other dynasties, divided the territory among themselves. The dynasty that actually brought about this overthrow of the Vākāṭakas seems to have been the Chālukyas, who acquired a part of the territory directly dependent upon the Vākāṭakas in the north, gradually extended southwards and till about the close of the sixth century, they came into possession of what is now called the Southern Maratha country in the possession of the Kadambas, and thus came into touch with the Pallavas of Kanchi, set over against them in a south-easterly direction. From about A.D. 600 therefore these neighbouring powers show themselves to be rivals constantly fighting along their common frontier and carrying on the war to the uttermost extreme. During the period when the Chālukyas were thus emerging into

existence, the Pallavas extended their authority southward till they actually extended their boundary to the river Kaveri, so that the Chola kingdom formed a part of their own territory. Thus consolidated the Pallavas showed themselves the equal of the Chālukyas, and during the period during which the two dynasties existed, they continued the wars constantly, as if nothing could settle the question finally except the extinction of the one or the other power. The Pallavas called themselves early Trai-rājya. Pallavas, that is, that they were a single power of the south, claiming authority over the three kingdoms, the Chera, Chola and the Pandya. At this period, India falls into three divisions constituting almost three empires : (1) the empire of Harsha in Hindustan, extending up to the Vindhyas ; (2) the empire of the Chālukyas under Pulikesin II extending from the Vindhyas to the frontier of the Krishna Tungabadra ; and (3) Tamil India under the domination of the Pallava king, Narasimhavarman I of Kanchi. That was the state of political division when Hiuen T'sang travelled in India and came as far south as Kanchi.

The period of the great Pallavas extending from about A.D. 600 and lasting on to the last quarter of the ninth century may be counted the period of Pallava dominance in South India. The Pallavas stood forward as the representatives of the south against the aggressions of the Chālukyas, who, in their invasions of the south, had in the earlier stages no further motive than that of securing possession of their conquest in the southern part of their dominions. When that ended unfavourably and the Chālukya power was laid low in dust almost by the destruction of their very capital under the greatest of their rulers, Pulikesin II, their invasions of the south took on the form of an effort at uprooting the Pallavas and asserting their authority in this region as well. In this great struggle between the two powers, the fortunes of war varied, and ultimately the Pallavas managed to maintain their ground, and the Chālukyas passed out of existence after about a couple of centuries. The Pallavas therefore may be regarded during this period as *the* power in the south against the Chālukyas, whose ambition may be described as the conquest of the Tamil land itself.

The Pallavas, like their contemporaries the Chālukyas, while having to do a good deal of fighting had not neglected the arts of administration and the promotion of learning and culture. It is to this age of the Pallavas that we are indebted for a large number of South Indian temples, cave as well as structural, most of the principal shrines having come into existence then, or, being already in existence, had been put on a more prominent or exalted footing. With the coming in of temples and temple building, came also the practice of giving donations and gifts to these temples and to Brahmans, and the period is remarkable for the large number of copper-plate charters as well as some stone inscriptions. There are records besides which give us an idea of the large number of works of public utility other than the building of temples and the settlements of Brahmans called *Agrahāras*. These latter had for their main purpose the promotion of learning and research, such as the Bahur plates give indication of. Learned Brahman families were got together from great distances and settled in salient points with the proverbial house

and the normal tenement of an acre and a half of land for the maintenance of the family, so that these learned Brahmans may prosecute and develop their learning in peace, if not in plenty. The records give an insight into the existence, and maintenance of roads, the construction of large tanks and irrigation channels, the provision of a service of ferries and other public needs.

Kānchi had an early reputation in Brahman literature as one of the seven holy cities, and it had a wide reputation as a *Ghaṭika*, or settlement of Brahmans and a centre of Brahmanical learning. It is no less famous as a Buddhist centre as well as a Jain. Though occasionally there were controversies and disputations of a serious character among the votaries of these different religions, the normal state seems to have been one of peaceful pursuit of life, each according to his light. The age of the Pallavas witnessed the output of the far greater part of the religious literature of the Tamil land. The poems embodied in the *Vaiṣṇava Prabhandas* and the hymns of the Saiva saints were produced in this age. The royal family counted among

them Saiva and Vishnu devotees who devoted great attention to the promotion of learning. All of them, generally, took some pains to promote Sanskrit learning. Some of the rulers themselves have been learned men. As a supreme example of this may be mentioned Mahendravarman whose accomplishments were very varied. He could write a Sanskrit drama or plan a cave-building, patronise musical treatises and many other things of the kind. He was not perhaps alone in this varied activity. Sanskrit learning seems to have flourished also, and it is hardly necessary to mention more than the fact that Bhāravi and Daṇḍin enjoyed the patronage of the Pallavas.

The charters give us a glimpse into the enlightened character of the administration as a whole, though the information that we can acquire from them is to some extent imperfect. It gives us already a foretaste of the administrative system which we are able to see in greater fulness from documents of the Cholas and the period immediately following.

When the Chālukyas went out of existence chiefly through the exertions of the Pallavas on

the one side and the feudatory Rāshtrakūṭas with the Pallava alliance on the other, the relative position of the Pallavas and the rulers of the Dekhan remained much the same. The first Rāshtrakūṭa seems to have remained in alliance with the Pallavas. His successor was otherwise busy creating trouble for himself on this frontier. But very soon the policy changed. The succeeding rulers left the Pallavas at peace while they were engaged themselves in the north-east. This was the period of the rise of the Gurjara power in Rajaputana which had to maintain a contest against the rising power of the Palas under Dharmapala of Bengal. In the wars between these two for the possession of Kanauj which at the time had become a kingdom in a high state of decline, the Rāshtrakūṭas had to intervene with effect. But even so the great Rāshtrakūṭa ruler, Govinda III, had to pay some attention to the south and more to the east where the eastern Chālukyas, the cousins of the rivals of the Pallavas, were rising in sufficient importance to exercise important influence in the politics of the Dekhan. The great achievements of the

Rāshtrakūṭas in the north, notwithstanding, their attention was often turned to the south to keep the Ganga frontier safe on the one side and the eastern Chālukya frontier on the other. It was the rise of a new Chola State in the region of Tanjore that ultimately brought about the downfall of the Pallavas.

From the accession of the great Nandivarman Pallava Malla at the commencement of the eighth century, the Pallavas had to maintain a struggle in the interior against the partisans of the rival and the more legitimate claimant to the throne. They had similarly to fight constantly against the Pandyas as the head of the Tamil powers now, as there seems to have been all the time that the Pallavas existed, a considerable amount of some kind of jealousy between the Pallavas and the Tamil kingdoms. In the face of the Chālukya enemy, these Tamil powers sometimes joined the Pallavas and more than once, they were able to roll back the tide of Chālukya invasion from the banks of the Kaveri successfully. The accession of Nandivarman created a new position and the Pandyas as the really most important power at the time

made an effort to reap the greatest advantage from the change. As the power of the Chālukyas declined, the Pandyas took advantage of it to make an advance northwards, take possession of Kongu and extend their influence over the territory of the Gangas, the Pallavas more or less countenancing this effort after a period of struggle to prevent them from doing it. In the process of establishment of the Rāshtrakūṭa power, this frontier was left at peace, but the Pallavas remaining in alliance, the Pandyas were able to establish themselves in a position of some considerable importance. When, in their turn, the Rāshtrakūṭas became aggressive on this frontier, the Pallava-Pandya alliance seems to have continued for two or three generations more. The policy of the Pallavas seems to have undergone a change or it may be that of the Pandyas, the reason for which has not become quite clear. The Pallavas and the Pandyas are seen fighting on the banks of the Kaveri and the Gangas that were allies of the Pandyas are now seen to be subordinate to the Pallavas. It is in the struggle against the Pandyas that the Pallava power suffered a vital

injury. Advantage of it was taken by the rising power of the Cholas. The Pallavas under Aparājita suffered a crushing defeat from the Pandya Varaguna II near Kumbakonam. But there remained enough of the Pallava power to turn back the Pandya aggression from the frontiers of the territory of Kanchi proper. When the rising power of the Cholas established itself in Tanjore, and this must have been at the expense of the Pandyas, they felt sufficient confidence, and one of the earliest achievements was to deal a death blow to the Pallava power and annex the territory of Tonḍamanḍalam to their own dominions and give it a new name, Jayamkonḍacholamanḍalam. This took place about the end of the ninth century and Kanchi, thereafter became the capital of the Chola territory of Jayamkonḍacholamanḍalam. With that began the consolidation of the Chola power and the first great Chola, Parāntaka I by name, came to the throne early in the tenth century, carried his arms successfully against the Pandyas, extinguished the Pandyas as an independent power and seems to have effected a conquest even in Ceylon. With him the Pallava

power vanishes out of view and the kingdom of the Cholas stands established in full vigour as the dominant power in Tamil India.

The period of Parāntaka corresponded with the struggle of the Rāṣṭrakūṭas against the rebellion within their territory by the scions of the Chālukyas, whom they themselves overthrow. It is this opportunity that was taken advantage of by the Cholas to lay the foundation of their power well and truly, and Parāntaka stood forward as the leading Tamil ruler in the south. With him begins the Chola empire which lasted for almost four centuries, not merely the dominant Tamil power but the dominant power of South India, which extended its authority practically over the whole of the Madras Presidency with a dominant influence over the kingdom of Kalinga and having among their records a successful effort at defeating and bringing into alliance, if not into allegiance, the territories of Bengal and Bihar up to the Ganges. The kingdom established by Parāntaka had to stand its ground against its enemies, the Gangas and the Rāṣṭrakūṭas. In the struggle the Cholas suffered a temporary eclipse.

Under Rājarāja the Great, the Chola power emerged more brilliant than ever before and maintained itself in that brilliancy for a little over a century under five generations of five great Cholas beginning with himself and ending perhaps with Vikrama Chola, the son of Kulottunga I. This is the period when the Chola empire reached its zenith of glory and brilliance, in their extensive conquests no less than in the establishment of a beautifully well-ordered administration on absolutely modern lines. The period was also remarkable for the promotion of the arts of peace and the prosecution of those magnificent public works, which are the admiration of engineers in the Kaveri Delta. The administration grew somewhat feeble for two generations but revived under another Kulottunga, Kulottunga III. He beat back a great invasion from Ceylon under Prabhakarabahu the Great, and re-asserted the Chola authority over the kingdom of the Pandyas. With his successors came a Pandya revival and the Pandyas were able to wreak their vengeance upon the Cholas for the crushing defeat and insulting treatment that they suffered at the

hands of Kulottunga III. In this struggle the Chola power was maintained for a short while by the intervention of the Hoysalas from across the frontier in the north-west to succumb ultimately, the Pandyas taking their place as the leading South Indian power. The Pandya revival lasted throughout the whole of the thirteenth century and could count in this period one or two of the greatest rulers of South India. Their territory was so extensive, the spoils of war so great, the administration so efficient, that one of them Jatilavarman Sundara Pandya I could weigh himself against gold, sitting on the back of his state elephant of the best size and give to the temple of Srirangam which had suffered neglect and some destruction at the hands of the Hoysalas, 18½ crores of gold pieces for the restoration of the great shrine. There was an unfortunate civil war between the rival claimants to the Pandya throne at the commencement of the fourteenth century, when Malik Kafur, the general of Ala-ud-din Khilji was knocking at the gates at the northern frontier, which opened the way for his entry into the Tamil land and thus introduced the first

wedge. Malik Kafur's invasion was a great plundering raid and the garrisons that he planted in salient places were turned out of the Tamil country by the enterprise of a ruler of Travancore, Ravivarman Kulasekhara, who carried his arms successfully as far north as the town of Nellore and even the frontiers of the Krishna and re-established Hindu rule.

The Hindus even at this distance were not destined to live long in peace. The achievements of Ravivarman Kulasekhara could but be of temporary effect. Muhammad-bin-Tughlak, when he had established himself on the throne and made himself master permanently of the Dekhan, carried his arms into the distant south and about the date A.D. 1335 could claim possession of an empire bigger than that ever enjoyed by the great Mughal Emperor Aurangzeb and almost as great a one as the British now enjoy to-day if Burma be kept out of the reckoning. The empire was no sooner established than its dismemberment came through defects of personal character of the monarch as well as the insane cruelty which often took possession of him against insubordination, real

and fancied. This Muhammadan governor of Madura tried to found a dynasty in the capital of the Pandyas, which lasted through a succession of about half a dozen rulers and it is the turning out of this garrison from Madura and a similar one in Cannanore about six miles north of Srirangam in the capital Hoysalas, that proved the crucial achievement that laid the foundation of the Hindu Empire of Vijayanagar.

It was to the credit of the self-sacrificing great Hoysala, Vira Ballala III hitherto regarded by historians as a pusillanimous coward, who abandoned his capital for the shelter at Tiruvannamalai, that this foundation was beyond little doubt due. There is record of a series of successful efforts progressively extending his power so far as to evoke the remarks of a Muhammadan historian, that his was an effort to surround the Muhammadan garrisons in the south and stifle them. He achieved great success, but fell in the fight in a great battle at Trichinopoly, victory in his hands, in one of these unlucky enterprises when he was surprised and taken prisoner by a small body of Muhammadan cavalrymen. He was put to death, and

that death had been more than avenged by the successor of the Muhammadan Sultan having been similarly put to death, and the territory of Madura taken from the hands of the Muhammadans by Prince Kumara Kampana, the son of Bukka, so far counted one of the two brothers, who are associated with the foundation of the Vijayanagar Empire. Vijayanagar was a foundation of Vira Ballala, though not called by that name, and five brothers, as officers set by him along the northern frontier against the rising kingdom of the Bahmani Sultan in Gulburga, ultimately succeeded where their masters failed, and Vijayanagar State was established at the end of the struggle, in which Vira Ballala lost his life. Bukka's achievements through his son Kumara Kampana marked for the time the recovery of India south of the Krishna for the Hindus and the establishment of Hindu authority there. It was fittingly signalised by the restoration of the Srirangam temple, which had suffered considerable damage at the hands of the Muhammadans, who had established their garrison at Cannanore, and the complete rebuilding of the temple at Madura

which had been thoroughly rased to the ground and destroyed by fire in the invasion of Malik Kafur and others that followed him. It is further as a result of this, that the succeeding ruler of Vijayanagar, another son of Bukka, Harihara II, established himself unquestioned emperor of the Hindus in the south. This empire lasted for two centuries and a half, the glory and admiration of travellers from afar, whether the traveller came from Central Asia or Europe. It consolidated not merely the Hindu territory in the south, but made a strenuous effort at conserving all the elements of Hindu culture which were suffering destruction beyond recovery, and such of the remnants of the Hindu learning and culture which we find in this part of India to-day, more orthodox perhaps even than the orthodox Aryan land of the north is due to the magnificent newly founded empire whose one preoccupation was to keep the Muhammadan neighbour of the Bahmani at arm's length from the northern frontier from the point of view of war. Its rulers found time nevertheless to pay some attention to the arts of civil government and human progress, to

such an extent that it proved to be an age of prosperity, which compared favourably with the countries of Europe and even with the great Holy Roman Empire. It was regarded as no less by travellers from Central Asia coming from the great kingdom of Samarkhand. Four dynasties of these rulers held rule with the normal incidence of usurpation and even civil wars, but on the whole they were able to maintain themselves in efficiency and prosperity notwithstanding the constant wars against the Muhammadans. One great weakness which they probably inherited from their predecessors was that they did not show the enterprise, that they showed, in other departments, in the building up and maintenance of a navy. Naval enterprise was not altogether foreign to the Hindus ; they seem to have been efficient navigators pretty early in their history. Their colonies extended to the islands of the east and went across into the continent, and by way of land South Indian influence may be traced almost up to the frontiers of China, not far from Canton. The civilization of these regions is in many respects Indian civilization, Brahman and Buddhistic,

the earlier seems to have been due to South Indian influence and the later to North Indian, and all these could not have been achieved, and regular communication with the distant lands maintained without the possession of a navy. The Pallavas had their flotillas which could carry armies across and hold their own against the naval power of the Sailendras of Sumatra and later on of Java. The Pandyas seem to have had also, as there is record, at least won a great war against the kingdom of Sri Bhoja. The Cholas showed themselves to be a terror to the very same power and inflicted upon them, when they were the most powerful, a crushing defeat. The passing away of the Chola power and the re-establishment of the Pandya dominance coincided with the advent of Arab enterprise, and gradually and peacefully Arab nautical enterprise superseded that of the indigenous. This supersession had the effect of making the nautical people of South India gradually give up distant enterprise on the seas, and this contributed directly to the Islamisation of the Islands of the Archipelago. It is this gradual and peaceful supersession of the Hindus.

by the Arabs on the sea that seems to have tainted the otherwise vigorous policy of Vijayanagar and in all that we hear of their constructive efforts we fail to notice an effort in this direction notwithstanding the fact that their territory enjoyed the prosperous trade of as many as 300 ports. With this came in a new influence. The Portuguese rounded the Cape of Good Hope and effected their first settlement in the West Coast of India. This introduced a new element, and we find the struggle of the Portuguese on the sea against the Arabs and Turks, and not against the Hindus of Vijayanagar. Notwithstanding that the very prosperity of the Portuguese depended upon the prosperity of Vijayanagar, and when Vijayanagar fell ultimately before the combined armies of the Muhammadans of the Bahmani kingdom, it had been all along a standing menace to their existence, the prosperity of the Portuguese vanished, though this was not the sole or the exclusive cause that brought about the destruction of the Portuguese prosperity. The Empire of Vijayanagar broke up chiefly through the sustained efforts of the two southern

Bahmani kingdoms, Bijapur and Golkonda, which through half a century of struggle pulled out of the empire bits of territory till the emperor was left without an empire. It was this emperor who confirmed a charter given to him by his immediate predecessors six years before and engraved in letters of gold that charter which laid the foundations of the British power in this part of the country ultimately to blossom into the British Empire in India. What was left of the empire was the kingdom of Mysore and a number of chieftancies, in what is now Mysore and the west coast set over against it, a great viceroyalty at Madura, the viceroyalty at Tanjore and the governorship of Ginjee. Whereas near the headquarters there was the Governor of Kalahasti from whose territory it was and through the good offices of one of its rulers that the East India Company agents, Coggen and Day, secured a charter which laid the foundations of Fort St. George. The history of Fort St. George has already been told by Mr. Dodwell for the *1922 Handbook of the Indian Science Congress*.

I may with advantage bring this history of

South India to a close with a brief narration of the other Hindu States which emerged from the empire of Vijayanagar. When the last great emperor passed out of existence about the year 1677, the viceroyalty of Madura cherished the ambition of extending its conquests, and got into hostility with the kingdom of Mysore which had been already founded and which had time to establish itself on a fairly firm footing. In the previous generations, a civil war took place among the feudatories, which disabled both Ginjee and Tanjore to such a great extent that they fell an easy prey first to the invasion of Bijapur and subsequently to Maratha invasions, so that these two were the only two powers which were left in the last half of the seventeenth century and the first third of the eighteenth. Mysore and Madura fought against each other and wore themselves out in the struggle. Mysore had still time to extend herself gradually to appropriate the whole block of territory which now belongs to her and even more on the borderland. The usurpation of Hyder Ali put an end, for the time, to Hindu rule till it was restored by the British at the

commencement of the nineteenth century. The viceroyalty of Madura came to an end in 1773 through the progress of the newly created Nawabship of Arcot under the great Mughal Nizam-ul-Mulk, who established himself independently in the Dekhan when the Mughal Empire broke up. The Muhammadan conquest of Madura proved temporary and, through varying fortunes, the British finally established themselves as rulers of the territory of Madura and laid the foundation of the Presidency of Fort St. George, almost about the time, just a few years later when they overthrew Tippu Sultan and restored Mysore to the scion of the Hindu dynasty from whom Hyder Ali took it. This marks the foundation of the Madras Presidency and the establishment of British rule in this part of the country.

S. K. A.

THE CITY OF MADRAS

MADRAS like its sister Presidency towns of Calcutta and Bombay and like the vast British Empire in India of which it is the third city in population and wealth is the offspring of the fruitful union of British enterprise and Indian co-operation. But unlike Calcutta or Bombay, Madras started with no natural advantages in its favour. It has unlike Calcutta no fertile hinterland watered by two mighty rivers, the Ganges and the Brahmaputra, nor unlike Bombay has it a fine natural harbour at the gate of India to do trade with the civilized countries of the West. What Kipling says of Calcutta 'chance directed, chance erected' is less appropriate to her than to Madras. The site on which Madras was built was selected by chance on sand thrown up by the sea and the town was built on an exposed sea coast subject to violent storms and surrounded by districts not naturally

very fertile nor possessing mineral resources. As the hearth and the cradle of the British Empire in India possessing a population industrious, intelligent and above all, very level-headed, Madras played a very important part in the early history of British India.

The first factory established by the English in South India was at Masulipatam which was then the seaport of the Kingdom of Golconda but the first fortified settlement of the English in South India was at Armagon. Francis Day, the chief of Armagon, finding this place unsuitable for trade went southwards in search of a site for a new settlement and obtained from the Naick of Poonamallee permission to establish an English settlement at Madras. This was in 1639. This grant was soon after confirmed by the scion of the royal house of Vizianagar settled at Chandragiri. The settlement thus established about three hundred years ago has now grown into the third city in the Indian Empire. Madras at the last census had a population of 528,791, and the area included within the municipal boundary is about twenty-seven square miles, the extreme length of the city

from north to south being about nine miles, and greatest breadth east to west about four miles. Till not very long ago, this big and historic city looked like a collection of scattered villages. Even now its beautiful houses hid among the large trees in the spacious gardens surrounding them offer amenities to their dwellers denied to those living in any other city in India.

The municipal affairs of the city are managed by a Council and a Commissioner. The Council consists of fifty councillors of which thirty are elected by the ratepayers of the thirty municipal divisions, eleven by various institutions and nine are nominated by the Government. There are four standing committees of seven members each dealing with taxation and finance, works, health and education. The Commissioner, who is a Government officer and who is appointed by the Government, is the head of the executive. Each year in November, the Council elects one of its members as President. The three principal officers of the Corporation are the Revenue Officer, the Health Officer, and the Engineer, who are appointed by the Council subject to confirmation by the Government.

The income of the municipality is inadequate to meet the demands for amenities which a city population even in an oriental country has learnt to make and with its high rates of mortality, inadequate water-supply, defective drainage, Madras has to travel a long way before it approaches anywhere near the standard of municipal administration set up by many of the cities of the West. But there can be no doubt that within the last few years, some improvements have been noticeable and the 400 miles of streets are better maintained and better lighted and the beautiful Marina which is the pride of Madras and the envy of all other cities of India has grown more beautiful of late years. An endeavour is also being made to remove congestion, to clean the paracheries and to settle the surplus population of the town on what were till recently suburban areas.

The revenue administration of the town is in the hands of the Collector who performs a number of duties, some of which are different from those which the Collectors of other districts are called upon to perform.

The Madras harbour is a monument to the

genius of British administrators and British engineers. 'Nature having done nothing for the provision in Madras of any kind of shelter for shipping, an artificial harbour had to be built by enclosing a part of the open sea by walls to provide for the trade of a capital city. The harbour as described by its creator was 'a challenge flaunted in the face of Nature' and this challenge is sometimes met by Nature in a manner which is disastrous to the shipping in the port. A nine acre boat basin serves for the safe anchorage of all small craft from 1,000 tons downwards working in the harbour. It is equipped with 1,690 feet of shallow quay wallings alongside of which barges and cargo boats can lie. A canal from the boat basin leads into a two acre timber pond. The port is provided with piping through which oil and petrol may be pumped into installations from vessels lying at the moorings. Horses and cattle can walk straight ashore into or embark from paddocks without the intervention of railway wagons. The West quay provides berthing for four and in an emergency six vessels of 26 to 30 feet draft. There are three other ship quays, viz.,

the Outer quay, the East quay and the South quay.

Beyond the harbour, a short distance to the south of it, begins the beautiful Marina to which allusion has already been made. It is a beautiful promenade about three miles long stretching to San Thome. On the western side of the promenade are a number of public buildings, the Senate House, the Chepauk Palace (Office of the Board of Revenue), the Public Works Secretariat, the Presidency College and Queen Mary's College for Women. To the east on the sea is the Aquarium which is the only one of its kind in India.

Madras being a city of gardens, the public gardens do not attract so much attention as they would otherwise do in a closely built city. Mention must, however, be made to the Agri-horticultural Gardens on the Mount Road and the People's Park with the Zoological gardens in it.

Madras is the terminus of two railway systems, viz., the Madras and Southern Mahratta Railway and the South Indian Railway, though the headquarters of the latter

railway are at Trichinopoly. The former which serves the north and the west of the Presidency has its terminus at the Central Station and the latter which serves the southern part of the Presidency has its terminus at Egmore., These two railway companies manage 5,231 miles of railway between them. Of late rapid extensions are being made in railway construction. The city itself is served by the South Indian Railway from the Beach to Chetput and beyond to suburban areas which are opening up towards the south.

Besides the railway, the town is served by electric trams and motor buses which are capable of much improvement in appearance, comfort and service.

Madras is proud of its educational institutions and this is as it should be, it being the capital town of the most literate province of India. Of the four Indians who have been Fellows of the Royal Society, two hail from this Presidency. The University of Madras was founded in 1857 and its constitution was considerably changed in 1904 and 1923 and further changes are in contemplation. It is still mainly an examining

and supervising body but its examinations are the stiffest of any University in India. If it lacks the culture and the wider outlook on life of some of the Universities of the West, if it has yet failed to create the atmosphere which the genius of Sir Ashutosh Mukherjee created for the Calcutta University by affording facilities for scholarship and research and bringing into existence a band of young men with European reputation for original work, the University of Madras has none the less done solid work to spread education and its alumni are to be found all over India engaged in work requiring intelligence, industry and honesty of purpose.

Within the city of Madras, there are eight Arts and Science Colleges and also the Medical College, while in the suburb of Guindy is the Engineering College. Of the Arts and Science Colleges, the Presidency, the Pachiappa's and the Christian Colleges are the oldest and the Loyola and the Women's Colleges are the latest. What strikes a stranger in Madras is the spread of a workable knowledge of English among the lower strata of society in this town. A stranger

who knows English has no difficulty in finding his way about and transacting his business in this city, while in other cities of India a knowledge of the local language or at least of Hindustani is essential.

Madras is fairly well supplied with hospitals and some of these institutions attract students from other parts of India. This is specially the case with the Maternity Hospital, which is the best of its kind in India. The General Hospital requires better accommodation and equipment to do efficiently the work it is called upon to perform and large improvements and extensions are under contemplation. Besides the General Hospital, there are two other big hospitals one at Royapuram and the other at Royapettah with 354 and 100 beds respectively. There are also the Mental Hospital at Kilpauk, King Edward VII Tuberculosis Institute and Hospital at Egmore, Government Ophthalmic Hospital at Egmore, Government Hospital for Women and Children at Egmore, Government Victoria Hospital for Women at Triplicane, Raja Sir S. Ramaswami Mudaliyar's Lying-in-Hospital at Royapuram, Kalyani Hospital in

Mylapore, besides several dispensaries maintained at public cost. There is also a Veterinary College and Hospital at Vepery.

No account of Madras will be complete without a mention of its lawyers and its law courts and legal institutions. The fame of Madras lawyers both as judges and as legal practitioners has spread to other provinces of India. No province of India has produced a sounder judge than Sir T. Muthuswami Ayyar or a more profound lawyer than Sir V. Bashyam Ayyangar. The High Court and the Law College are imposing buildings in the so-called Indo-Saracenic style on the Esplanade not far from the Beach. The High Court has fourteen judges including the Chief Justice and the Law College has a Principal and twelve lecturers and the number of students on its roll last year was 897. Besides the High Court, there are the City Civil Court and the Court of Small Causes for the disposal of civil disputes and there are four stipendiary Presidency Magistrates and over 100 Honorary Magistrates for the disposal of criminal cases arising in the city.

To the north of the Esplanade lies the

business quarter of the town. The various banks and merchant houses are there. In Mount Road and in its vicinity are many shops, European and Indian, doing retail trade and some hotels.

Of the sights of Madras, the first and foremost is the Marina with its Aquarium of which mention has already been made. On the Fort Beach is marked the spot where the 'shell' from the 'Emden' fell during the late war which caused a panic in Madras. The Fort which also contains the Secretariat and some other public offices and the Legislative Council Chamber is also well worth a visit. In it is St. Mary's Church which is the oldest Anglican Church in India opened for worship in 1680. It was in this Church that Clive was married. The other important places of Christian worship are the Cathedral Church of St. George in Teynampet opened and consecrated in 1816, St. Andrew's Church in Egmore dedicated to service in 1821, the Roman Catholic Cathedral (the Church of St. Mary of Angels) in Georgetown under the Archbishop of Madras and the Cathedral in San Thome under the Bishop of Mylapore.

Of Hindu temples there are two fine specimens—Sri Parthasarathi Swami temple at Triplicane and Sri Kapaleeswarar temple at Mylapore. These are of the usual Dravidian type of architecture though they do not come up to the standard of those colossal temples, which are the pride and glory of South India, met with in Madura, Srirangam, Tanjore, Chidambaram, Conjeevaram and various other places. Except Egypt and the old Hindu colonies of Java and Cochin China, no other country in the world can show such stupendous ancient monuments containing such exquisite carvings as these temples of South India. Compared with them, the temples of some of the holiest places in the north like Benares, Muttra or Brindaban are quite puny structures devoid of any architectural beauty.

The principal mosques in the town are the Wallaja Mosque and the Anwari Mosque.

Besides the University library, there are two other important libraries in Madras, viz., the Connemara Library and the library of the Literary Society. Opposite to the Connemara Library is the Museum and on the same road is

the Victoria Technical Institute. Mention has already been made of the Senate House and the Chepauk Palace on the Marina and the High Court and the Law College on the Esplanade. The Ripon Buildings, where the offices of the Municipal Corporation are located, the Victoria Public Hall and the Moore Market are clustered together at the entrance to the People's Park in the vicinity of the Central Station and the offices of the Madras and Southern Mahratta Railway. The Prince of Arcot lives at Amir Mahal, a palace in Triplicane.

Madras though one of the oldest of British settlements in India is yet young in spirit. Great as has been her contribution in the past to the work of founding and consolidating the British Empire in India, she aspires to greater achievements in the future. Her greatest asset is her population industrious, intelligent and law-abiding. In the chapter of Indian history that is now opening, Madras aspires to play a very important part. As in the past so in the future, her contribution though not showy is bound to be solid. She will not be swayed by blind passion. She will do nothing in haste.

In the past, the genius of her people found expression in literature and in temples and in works of irrigation. In the future, she will build stone upon stone, brick upon brick, on sure and solid foundation, till she remodels her society and body politic following the peculiar bent of her genius.

MADRAS CITY ARCHITECTURE

INTRODUCTION

THIS article has been written at short notice without reference to authorities on the subject. It does not profess to be historical although the buildings referred to have been divided into Periods for these periods refer rather to character than to time of construction. It professes to be a somewhat superficial description and criticism calling attention to what is interesting and good and thus helping to create a sound judgment in architectural matters. It is necessarily short and unreasoned. A word of explanation is necessary in view of the several references to architectural styles, as good architecture need not necessarily conform to any of the recognized styles. In Europe to-day many fine buildings, architecturally, are being constructed in the designing of which the historic

styles have been entirely discarded in an effort to get back to first principles. The styles are of value, as adherence to principles and proportions on which they are based is likely to produce good architecture as these principles have been developed over a number of generations of trial and error in which the material available, climatic conditions and customs of the country have had due consideration. But new materials demand new methods and new customs require re-adjustments and departures from tradition. Architecture is not a matter of superficial decoration but is bound up with the building itself and fulfilment of its purpose in the most efficient manner. 'Architecture' says Professor Lethaby, 'is the art of building and disposing of buildings. Good architecture is masterly structure with adequate workmanship; the highest architecture is likely to have fit sculpture and painting integrally bound up with it'.

In order to appreciate at their true value the buildings in Madras a short general criticism is necessary. Madras, like so many other cities, suffers from the fact that, during the period of

its greatest expansion and structural activity, Town Planning, the art that relates a building to its surroundings, was not practised otherwise in view of the number and variety of notable buildings, instead of being a disappointing city, architecturally, it might have been most attractive. It was a city of great possibilities but the formal dignity and monumental character which one naturally and reasonably associates with a capital city are almost entirely lacking. In this respect there is considerable similarity with most Capital Cities in the British Empire. It is natural that the administrative centre of a large State should reflect in the lay-out of its streets and the character of its buildings, the majesty and dignity of Government for it cannot be doubted that such characteristics in the Capital City would have a beneficial influence on the community and help to develop a sense of national consciousness and civic pride and responsibility.

It is almost impossible to point to a building of any importance in Madras, the placing of which in relationship to its surroundings, has been properly studied. This is typical of cities

of the British Empire and is, no doubt, partly due to the earlier development of democratic Government ; for whilst princes and potentates in other parts of the world were still planning their towns with the palaces as the focal centre of civic life, democracy had already put a check on the expanding activities of ambitious princes in England and its Dominions. The contrast can be seen in India between some of the Capital Cities of Indian States and the Capitals of the Presidencies. The former, although on the average much smaller, are much more the average man's conception of what a Capital City should be.

Paris is the Capital City par excellence owing to the fact that so many of its buildings of importance are placed in studied relationship to their surroundings either as terminal features to street vistas, or as parts of harmonious architectural street schemes or as in the manner in which they have been grouped around some public place or square. Buildings architecturally mediocre acquire dignity and grace if they are placed in harmony with their surroundings.

A few examples of this failure to relate buildings to their surroundings may be quoted :—

(1) Government House presents an array of clerks' quarters, garages and godowns to the gaze of the man in the street instead of an imposing facade approached by broad avenues ;

(2) The long frontage of the High Court is set at an angle to China Bazaar and has no relationship to it whilst part of the frontage of this most important street is occupied by buildings of an insignificant nature ;

(3) The Museum, Connemara Library and Theatre instead of standing in complementary relationship to each other impressively arranged round a public court or garden stand rudely in front of each other ;

(4) The Victoria Institute might have been placed as a beautiful terminal feature to Monteith Road adding dignity to itself and to the road ;

(5) Chepauk Palace presents an unsymmetrical elevation to Wallajah Road not quite in axial alignment with it.

It would be possible to go on giving examples of this unfortunate characteristic but

enough has been said in explanation of the fact that Madras as a city is disappointing although it has all the necessary ingredients required in the composition of an impressive Capital. We are really better off than the casual visitor might suppose but our architectural display has been badly organized.

Buildings have not been included from their archaeological interest but in order to give a slight historical flavour to these notes they have been placed in four categories or sections as follows :—

- (1) Hindu ;
- (2) Early European Settlements (seventeenth and eighteenth centuries) ;
- (3) Victorian (later nineteenth century) ; and
- (4) Modern (twentieth century).

FIRST SECTION—HINDU

In this section there is very little of note. Books on Indian architecture do not refer to any buildings in the city and no one, unfortunately, visits Madras to see the glory of its ancient buildings !

Mylapore Temple and tank is perhaps the best known Hindu building and Parthasarathi Temple and tank at Triplicane perhaps the most interesting. The latter is of very ancient tradition and much sanctity and is dedicated to Vishnu ; the former on the other hand is dedicated to Siva. The most noteworthy feature at Mylapore architecturally, is the unbroken flight of granite steps surrounding the huge tank, a bold conception recently carried to completion. The tank with its central island pavilion and the temple and palm trees in the background is one of the most pleasing pictures in Madras. The chief feature of the temple is a *gopuram* of good proportions and considerable size situated behind a smaller entrance *gopuram* the latter being with the outer wall, decorated in the usual manner in alternate red and white vertical bands.

Early Muhammadan buildings have not been included as there are no buildings of architectural importance in the style but mention should be made of Shah Aulaiy's tomb, situated on Barbers Bridge Road between Triplicane and

Mylapore, a picturesque white domed building in the Indo-Saracenic style, a place of considerable veneration to Muhammadans.

SECOND SECTION—EARLY EUROPEAN SETTLEMENT

Of the buildings of the early settlement, in which I include those up to the early nineteenth century, St. Andrew's Kirk is probably the most noteworthy, architecturally, because of its unusual construction, a circular dome on a complete circle of twenty detached columns. It is situated on Whannells Road and Poonamallee High Road by Egmore Station and is a monument to the genius of Major de Havilland of the Engineers, the Christopher Wren of Madras, who was also responsible for the St. George Cathedral, etc. The St. Andrew's Kirk. Cathedral, like the Kirk, is a building of fine proportions in the English renaissance style. Both these buildings are finished externally and internally in the celebrated Madras chunam made from sea shells

which weathers almost like marble. The internal columns in the Cathedral are fine examples of highly polished plaster. The Cathedral was finished in 1816 and the Kirk in 1821. Recently the apsidal east end of the Cathedral has received a handsome marble reredos. The Cathedral is on Mount Road about three miles from the Fort opposite to the Agri-Horticultural Gardens.

Government House (Mount Road south of the Island) is externally undistinguished being without balance or substance, its main frontage consisting of three superimposed rows of attenuated columns with tatties between. The adjacent Banqueting Hall is however a building of distinction but badly placed with respect to Government House or appearance from the road. It was built by Lord Clive in 1802 to commemorate the fall of Seringapatam and is of classic style and detail. Unfortunately it has been surrounded with arched verandahs and balconies which are not in harmony with and put it out of comparison with the great classic buildings of the

world. Internally it is a finely proportioned columned hall enlivened by historic flags and oil paintings. The best views of Government House and the Banqueting Hall from outside the compound can be obtained from Adam Road on the south bank on the Coom.

The buildings in Fort St. George naturally come within this period. The most interesting to the visitor is St. Mary's Church the subject of another article. The Accountant-General's Office opposite, once the residence of Clive may be mentioned for that fact and for its interesting classic facade. The Secretariat itself is a building of some size in the English Renaissance style but unfortunately its main facade is towards the west and the dignity that might have accrued to it, as the dominant building in the Fort facing the central square, is lost behind an irregular group of shade trees and a mass of unsightly sunshades, whilst other elevations are disfigured by inappropriate excrescences. Its western facade has been much improved recently by the addition of projecting wings at each end. The

**Fort St.
George.**

**The
Secre-
tariat.**

building is also unfortunately somewhat marred by the false jointing in the plaster work which does not comply with the apparent structural requirements and by inconsistencies in the colour scheme. In front of the Secretariat is a pleasant classic stone canopy which once held the statue of Lord Cornwallis now in the Connemara Library.

On the east side of the Secretariat is the New Council Chamber which as an addition is mentioned here though it properly comes in the fourth or last section being added in 1910. The facade is noted for the twenty polished black granite columns, called Pitt's columns from the fact that they originally formed a colonnade from the Fort to the sea gate built by Governor Pitt. In 1746, when the Fort was captured by the French, these columns were removed to Pondicherry but were recaptured and returned in 1760 !

The Council Chamber is a room of pleasant proportions finished in teak panelling and polished white plaster with a black and white marble floor and a fine plaster ceiling in high relief. The internal effect is somewhat spoilt

by the forest of fans ; and the hangings and amplifier which have been found 'necessary to improve its accoustic properties. Unfortunately the building is located behind the great central bastion, the old sea gate of the Fort, and it is impossible to obtain a good comprehensive view of it.

There is no space to mention any of the other buildings in the Fort but it may be remarked that there is simplicity and harmony about the early work with its scholarly classic or Renaissance details but architectural deterioration has resulted from the many alterations and additions to which the buildings have been subjected.

In addition to the buildings already mentioned, this period produced a number of commercial buildings of importance, some of which remain along the North Beach Road, and a large number of bungalows, some of them quite palatial, scattered about all parts of the city outside of Georgetown. Some of these are preserved very much in their original state, others have been altered out of recognition and some have fallen from

**Commercial
Offices.**

**Company
bungalows.**

their original state. Special mention might be made of Doveton (School) Vepery, the Moham-
 medan College, Mount Road, Blackers Gardens
 and Newington, Mount Road, Rutland Gate,
 Bensons Bungalow (the Women's Christian
 College), The Albany, The Adyar Club,
 Brodies Castle, etc. There is also the Madras
 Club, the simple classic facade of which seen
 from Mount Road is given dignity by its location
 as the terminal of a vista of trees. In keeping
 with these are some of the bungalows and
 buildings in San Thomé and Mylapore of Dutch
 or Portuguese origin, the details and proportions
 of which were frequently particularly scholarly
 and pleasing.

Of this period mention must also be made of
 the Old Light House finely built in
 granite in the form of a gigantic Doric
 column but now overshadowed by the
 High Court in the compound of which it stands.

The early Church at Luz (the earliest in
 Madras) and the ancient Churches at
 Little Mount and St. Thomas' Mount
 so intimately connected with the
 reputed life and death of St. Thomas,

**Old Light
House.**

**St.
Thomas'
Mount.**

should be mentioned here although they are of an earlier period. The Mount particularly should be visited by those who have time.

THIRD SECTION—VICTORIAN PERIOD

This era has unfortunately been writ very large on the architecture of the city and one fears the writing is almost indelible ! Reference has been made to the architectural loss due to the failure to relate buildings to their surroundings and I must here refer to another unfortunate characteristic of the buildings in the city erected during this period, viz., the lack of harmony between adjacent buildings. In this respect there is a striking contrast to the architectural harmony that pervades the Fort and the domestic architecture of the early settlement period or the architectural developments in Georgetown and Triplicane where, except for modern additions and new buildings, a general harmony still frequently exists. This discord which Mr. Trystan Edwards, a well-known writer on architectural matters, calls 'architectural bad

manners' can best be seen along the North Beach Road, China Bazaar, the General Hospital and Poonamallee High Road, Mount Road and the Marina, the four main arteries leading from the Fort to the north, west, south-west and south.

The pleasing and appropriate traditions of the eighteenth century, whether Western or Indian, were discarded and a spirit of emulation was adopted with particularly deplorable results in a country in which building was comparatively cheap. Many of these buildings are the result of praiseworthy but generally unfortunate attempts at Indianisation. The buildings in the commercial area of Georgetown were in this respect generally much more successful than those in Mount Road. It would be difficult to find anywhere in the world a more depraved collection of incongruous and pretentious, architectural atrocities and absurdities than is strung out along the margins of Mount Road! Fortunately a number of the original avenue trees are still preserved to us or Mount Road would be appalling! One of the most prominent of these buildings is the block known as W. E. Smith's

but there is one thing to be said, in favour of this block, that in plan it does take cognizance of the shape of the site and is designed to make the best use of the location.

Of the buildings along the North Beach Road the General Post Office is one of the most interesting and attractive attempts at Indianisation. The lower parts of the building may be described as Dravidio-Gothic but in its upper parts it has a strong Teutonic flavour. Some of the details of the stonework in the lower floors are pleasing.

Other prominent buildings are the Imperial Bank, National Bank of India, the Mercantile Bank of India, the Custom House and Collector's Office but particular mention must be made of the police station under the shadow of the National Bank, a charming little building and a very successful attempt to develop indigenous South Indian architecture, somewhat ornate and delicate perhaps for a police station which rather calls for boldness and severity.

Next door at Parry's Corner we find the frontage of what is probably the most valuable commercial site in the city occupied by garages and godowns !

**Parry's
Corner.** Rounding the corner into China Bazaar we are at once confronted by the amazing assemblage of domes and pinnacles, crowned by the Lighthouse, which

**China
Bazaar.** covers the greatest centre of activity in the City—the High Courts. The building is in the Saracenic style although it might be more truly described as

**High
Court** Indo-Gothic in many respects. The general impression owing to the multitude of domes is Eastern and much of the detail is Indian in character though of a somewhat mechanical nature. The most impressive and beautiful view of the building, and of others in the vicinity, can be obtained from the harbour arm at sunset. The silhouette of domes and towers against a tropical sunset, with the foreground of shipping and giant cranes, makes a picture to be remembered.

On the opposite side of China Bazaar is another medley of domes and towers—the

Madras Christian College. The late Dr. Miller, to whom the College owes so much and whose statue faces it from a little enclosure on the other side of the road, was a great builder with advanced architectural ideas. The several buildings composing the College are in a mixture of styles and no style in particular but the two-colour decorative scheme which is uniformly applied pulls the group together into a fairly harmonious whole. Dr. Miller has attempted, on a compressed scale and not without considerable success, to secure the wonderful architectural harmony in diversity which is seen at its best in the Colleges of Oxford and Cambridge.

Of the other buildings in China Bazaar the Y.M.C.A. is worthy of notice. It is the nearest thing in Madras to a skyscraper, having as many as four floors ! It is faced with beautiful pink stone in Indo-Saracenic style finely built consistently carried through.

The Law College on the opposite side of the road is in architectural harmony with its

neighbour the High Court and is one of the few examples of buildings (like W. E. Smith's just mentioned) which is arranged to suit the site as its main facade and entrance take cognizance of the important road junction which is the traffic hub of the city. Not far distant is

**Law
College.**

**Pachai-
yappa's
College.**

Pachaiyappa's College which exhibits a pleasantly proportioned Doric columned facade to the road, the effect of which is spoilt by the fact that the beam over the columns, which takes the place of the architrave in the Grecian buildings is coloured blue whilst the rest of the entablature, of which it is a part, and the columns supporting it are white. This is the most common error in the finishing of the multitude of buildings in this city which are based on the classic orders. The unity of the order is spoilt and the sense of structural adequacy, which the eye unconsciously demands, is lost. In a building to the surface of which plaster and colours are applied the design, rather than the foundation material, should be the basis of the colour scheme.

Pachaiyappa's have recently built an imposing and many domed hostel at Kilpaūk the best view of which is that from the train on approaching Chetput station.

Several other important buildings of this period are stretched along the Marina going south from the Fort. The Senate House stands first in order. This is one of the most impressive buildings of the city, of magnificent mass and proportion in Indo-Saracenic style but with detail of somewhat unequal merit. It also should be seen at sunset from the sand by the mouth of the Cooum or by moonlight. If anything is needed it is a central dominant feature but even without it the building is a real tour de force.

Adjacent to it is the Chepauk Palace now the office of the Board of Revenue, etc., a picturesque building which in point of time belongs to our second period but in character it is more in keeping with the third, being a distinct and fairly happy effort at Indo-Saracenic. The fine central tower was added later and actually belongs to the third period and is a well proportioned and very

successful essay in the style. In continuation of the Palace is the large P.W.D. Secretariat, prominently placed on the roadside, a building lacking in style or character or anything to commend it, a sad lapse from the standard set by the Senate House and Palace.

P. W. D. Secretariat.

The next in order is the Government Presidency College, a building of considerable character and interest, reminiscent of French and Italian Renaissance, somewhat florid perhaps but in this respect true to the style. The brickwork of the modern extension has, unfortunately been redded over and is out of harmony with the pleasanter tone of the original building. The general appearance from the Marina is not improved by the prominent location of the gas plant!

The Presidency College.

Another prominent collection of buildings of this period can be seen along the General Hospital Road and Poonamallee High Road running westward from the Fort. The first is the Medical College, another unfortunate building of no architectural interest prominently placed. Adjacent

Medical College.

to the College is the General Hospital, a building of the second period but so hidden by trees, compound wall, out buildings and excrescences that the character of

**General
Hospital.**

the original structure can hardly be appreciated from the road. The Hospital and College are now being reconstructed, enlarged and modernized at a cost of about 50 lakhs to the designs of Mr. W. H. Nicolls, F.R.I.B.A., late Consulting Architect. On the opposite side of the road is the magnificent new office block of the

M. S. M. Railway, but as a modern

**M. S. M.
Railway
Offices.**

building this will be discussed when we come to our last section. Next in

order is the Central Station, a building of very considerable merit. The south facade

**Central
Station.**

and clock tower are well proportioned and interesting in detail but somewhat

spoilt by the paltry cast iron railings and corrugated iron roof which are hardly in keeping with the remainder. In detail it is somewhat suggestive of Italian Gothic or early Renaissance.

Crossing General Hospital Bridge we come to the principal market of the city,

Moore Market, a somewhat mechanical attempt at Indo-Saracenic of no great interest. This is followed by the Victoria Public Hall, a large building of non-descript style, dull and depressing, hardly worthy of its fine open situation in the People's Park. Adjacent to it but a great contrast in style is the Ripon Building, the Office and Council Chamber of the City Corporation, one of the largest and most impressive buildings in the city. It is Renaissance in character with a massive and well proportioned central tower. This building should in point of time come under our fourth period but it does not exhibit the more refined and scholarly characteristics which are associated with the architectural revival of the twentieth century. Its detail is uninteresting and does not merit close study.

Other buildings in the city of this period to be noted are the Museum, etc., in Pantheon Road. The most prominent and the least interesting building in the group is the Museum Theatre;

behind and attached to it is a part of the Museum. Behind this is the Connemara Library an interesting though somewhat flamboyant essay in English Medieval style, inspired, no doubt, by the great collegiate halls in English University Towns. Behind this again is the original Museum building a pleasant and refined example of the work of the earlier or second period. What an imposing group this would have been if they had been harmoniously designed and arranged on three sides of an open square facing the Pantheon Road. In the next compound is the Victoria Institute which will be referred to in the chapter on the fourth period.

A small building in College Road, Nungambaukam is worth a passing reference.

**Madras
Literary
Society.**

This is the Madras Literary Society building in the compound of the Office of the Director of Public Instruction, a pleasantly proportioned and detailed building similar in style and character to the Police Station in North Beach Road already referred to.

The Roman Catholic Cathedral, San Thomé,

must be included in this period. It is a large building in fairly consistent but somewhat uninteresting Neo-Gothic style.

**St. Thomas
Cathedral.**

The Cathedral is celebrated from the fact that the tomb, believed to be that of St. Thomas (who gives his name to the place) is located therein.

Madras has a fine Veterinary College in Indo-Saracenic style but very few visitors would ever see it unless they have business in Vepery.

**Veterinary
College.**

MODERN—OR TWENTIETH CENTURY

Madras is not rich in modern architecture but it has one building of this period of outstanding merit, the M.S.M. Railway offices already mentioned. This is a building of the highest rank of which any Indian city might be proud. It is altogether in a class by itself, a free and successful rendering of traditional indigenous details on a framework of fine and satisfying proportions in which the essential character of Dravidian work has been realized. At the same time it is an

**M. S. M.
Railway
Offices.**

entirely modern building designed to meet the requirements of a large office. The central staircase hall should be seen as it is a fine domed apartment running through two floors more Renaissance than Indian in detail. The architect, Mr. Norman Grayson, was fortunate in the opportunity given him and in being provided with a stone which is more easily worked than the usual harder granite of South India. If there is anything that one can criticise architecturally it is the numerous octagonal domes which are hardly in character with the remainder of the façade. From the civic or social point of view one may also question the propriety of a commercial office building, even of a Railway, being so much more imposing than the Office of the State and the Council House of the Legislature! From the Madras and Southern

Egmore Station. Mahratta Railway Office we will turn to Egmore Station, the terminal of the main line service of the S.I.R. To most people who depart from Egmore in the dark or who arrive in the morning at the unpretentious northern arcade a sight of the picturesque southern façade may one day come as a surprise.

This is a fairly successful effort to Indianize the details of an important modern building though whether it is appropriate station architecture is another matter. It is in a back street with no direct approach and has no relationship to its somewhat untidy surroundings otherwise it would receive the notice that it deserves.

The Victoria Institute already mentioned is another modern building meriting
Victoria Institute. attention particularly on account of its rich Indo-Saracenic detail, the beauty of which compensates for any weakness in proportion or scale. The building is of pink Tada stone and was erected in 1906 as a memorial to Queen Victoria, a really beautiful piece of work.

Not far away, in Marshalls Road, Pudupet, is St. Anthony's Roman Catholic Church just completed and well
St. Anthony's Roman Catholic Church, Pudupet. deserving. This may be said to be Byzantine in atmosphere and is of consistent design throughout. Of good proportions with a central concrete dome at the crossing and a most satisfactory tower, it is a building in great and pleasing contrast to the rather flamboyant Gothic

which one associates with the Roman Catholic churches of South India.

In the same neighbourhood are the Government Eye Hospital and Government Maternity Hospital buildings in no particular style though the entrance block of the latter is a pleasant piece of work.

Not far away on the Spur Tank in Egmore is situated the Tuberculosis Institute a small but well proportioned domed plastered building, Western rather than Eastern in detail, the first instalment of the New General Hospital that was to have been built on the Tank area.

In the same district, but best seen from Graeme's Road on the other side of the Coom is the fine New Masonic Hall, a monumental, dignified and finely detailed white plaster building, the work of Messrs. Jackson and Barker of Madras, the simple skyline of which is in great contrast to the frequently too fussy silhouettes to which one is accustomed.

In addition to the above there are a number of recent educational and medical buildings of

which Queen Mary's College on the Marina, the Industrial School on Broadway, Royapuram Hospital and the Willingdon Training College near the Marina might be mentioned.

Of modern commercial buildings, Madras has very little to shew the visitor. The Mercantile Bank of India on the 1st Line Beach is possibly the most important. This is a building of four floors in the English renaissance style which would look quite at home in the City of London but which has nothing about it suggestive of India or the Tropics.

As the architecture of Mount Road has been criticised somewhat severely mention should be made of buildings on that road which have some merit. There are the two small stone fronted buildings, opposite Government House, Indian in their composition and detail. Then there is the Government Press opposite W. E. Smith's, a pleasant facade in Indo-Saracenic but possibly too ornate considering the purpose of the building. If so much is to be put into the facade of a building used as a printing press how shall we distinguish our temples and churches and our important public buildings? There is also

the pleasant stone facade of the motor car section of Messrs. Addisons' premises and the creditable new white plaster building which houses the Fiat cars. Khaleel Mansions, the large block of shops and flats at No. 35, Mount Road,, deserves mention as about the only building that is in scale with the road and for its stone columned and arched verandahs carried the length of the facade. On the opposite side of the road is one of the finest of the old bungalows of Madras now the Government Muhammadan College. The classic facade and the fine double sweeping outside steps leading to it were inspired by the celebrated mansion at Prior Park, Bath, England. Wings have recently been added but owing to the trees and an ugly hostel in the foreground a good comprehensive view of the whole block is not easily secured from Mount Road.

Of modern domestic architecture there is very little that can be seen from the public street that can be recommended. It is generally cosmopolitan in style exhibiting most of the defects of the West and the East, the more costly buildings being the least meritorious, often exhibiting a

jumble of unreasonable, unnecessary and undesirable ornament, having no relationship to structural requirements. They lack the fine classic proportions of the old eighteenth century bungalows and the charming Indian detail, so much of which can still be seen in the back streets of Georgetown, Triplicane, etc.

A poem by Mr. James Laver which appeared in *The Spectator* of September 22, 1928, though written with respect to London, is so appropriate to Madras in general and Mount Road in particular that I make no apology for quoting the last verse—

Ye, who rebuild our City,
Pause, and reflect awhile,
And, at the least, for pity,
Evolve an urban style !
Be taller, stronger, ruder,
But do not merely go
From imitation Tudor
To pseudo-Esquimaux !

R. D.

• ST. MARY'S CHURCH, FORT ST. GEORGE,, MADRAS

FORT ST. GEORGE dates from 1640, when Francis Day on behalf of the East India Company obtained the concession of a strip of land at Madraspatam from the Rajah of Chandragiri. The land was intended as the site of a small fortified settlement for the English trading community which was in danger of being attacked by the rival Dutch merchants. Fort St. George was thus the earliest of the British fortified settlements in India. It was a factory, in the older meaning of that word, that is, a centre for trade. Within the Fort there were erected the buildings necessary for trading purposes and in addition houses to accommodate the Company's staff. The first Fort was completed by 1650 ; a second Fort was constructed in 1666, while the third and final Fort was completed in 1787 and it is this Fort which we see to-day.

In the early days of the Fort religious services were conducted in a room in the inner Fort, somewhere on the site of the present Secretariat. But on the arrival of Streynsham Master in 1677, as Agent and Governor of Fort St. George, it was decided to build a church within the Fort. A subscription list was issued and the Governor headed the list with a subscription of 100 pagodas. The Church was built entirely out of the money subscribed, and the Company provided no grant. Work was begun on Lady Day (March 25) 1678, and the Church was therefore dedicated to St. Mary the Virgin. It was consecrated two years later by Richard Portman, Chaplain, on St. Simon and St. Jude's Day (October 28) 1680. St. Mary's was the first Anglican Church to be erected in India. The architect and builder was William Dixon, Chief Gunner and Designer of Bastions to the Honourable East India Company. Ecclesiastical architecture was apparently a sideline with him, but he built the Church on sound military principles. The roof of the Church was made five feet thick, to render it proof against the heavy artillery and bombs of that day.

Since then a further three-inch roof has been added. The present Church remains much as it was designed in the seventeenth century, except for the addition of an Organ Chamber, a Priest's Vestry and a Sanctuary. The spire was rebuilt in 1795-96.

Streynsham Master was succeeded as Governor in 1681 by a more famous personage, Elihu Yale. Yale was a New England colonist by birth but had been educated in England. He entered the service of the East India Company as a writer, or clerk, and was sent to Madras where he remained many years, until he finally became Governor. His marriage was the first to be solemnized in St. Mary's; three of his children were baptized in the font. He was a generous benefactor of the Church, as his gift of the Yale alms dish bears witness. His son David Yale was buried in the old cemetery, and the monument to him is one of the two still left standing on the original site.

Yale's greater claim to fame lies outside Madras. When he returned to England he was asked by some colonist friends to assist in the founding of a place of learning in New England.

He replied to this request by sending a large gift of books, worth then over £500, and the infant university in New Haven, Connecticut, was subsequently called Yale University.

St. Mary's has not always been used for religious purposes. Twite it has been used for more urgent undertakings. It was turned into a temporary barracks in 1751, previous to the French siege, while in 1782 it was used as a storehouse for food for the French and Dutch prisoners.

The cemetery connected with the Church has had a curious history. It formerly occupied the site of the present Law College. During the siege of Madras by the French in 1758-59 the enemy took cover behind the walls and monuments of the cemetery. When the Fort was recaptured, the cemetery was given up for military reasons, and the inscribed stones were removed to form a pavement round the Church. Two monuments only were allowed to remain, and they are to be found there to-day ; they were the monument to David Yale, and the family vault of the Powneys. In 1782 the grave-stones were torn up again, to be used this time as gun-

mountings, and many were thus broken. The rest were replaced in 1807 and they now form a pavement on the north side of the Church. The inscriptions on the stones are in a variety of languages—Armenian, Latin, English, Portuguese and Tamil. The earliest stone dates from 1652, and is inscribed to the memory of Elizabeth Baker, who was the wife of the first Governor of Fort St. George ; she died on her way to join her husband at Madras. Some of the stones in the pavement were taken from the cemetery of the Capuchin Church of St. Andrew which once existed within the Fort.

The Monuments. Within St. Mary's are buried many famous Englishmen who served in India. Some of their monuments may be briefly mentioned.

Six Governors of Fort St. George lie buried just below the Chancel steps. One of them had an unpleasant fate. Lord Pigot served as Governor from 1755-63, made a fortune of forty lakhs and bought an Irish peerage. He retired, but was recalled by the Company in 1775 to serve as Governor of Fort St. George ; his special purpose was to put down corruption

among the Company's servants. On his arrival he was seized by his enemies on his Council and imprisoned at St. Thomas' Mount, for eighteen months, and he died in prison. His grave is, marked by an incised cross, and the inscription, In Memoriam.

There were two Lord Hobarts who were Governors. The first was Governor from 1794-98 and his first wife and child are buried in St. Mary's ; he gave his name to the capital of Tasmania. Another Lord Hobart who was Governor from 1872-75 is buried in the Church. In memory of him his wife gave the lectern and the Princess of Tanjore presented the altar rails to the Church.

On the north side there is a fine statue by Ternouth of General Conway, who was Adjutant-General of the Madras Army, and died in 1837. He was known as 'the Soldier's Friend'. Seeing the pitiable conditions from which the British troops suffered, he secured the erection of permanent barracks for them and also an allowance of not less than a shilling a week for each serving soldier.

To the left of the Conway statue is a tablet

to the famous missionary, the, Venerable Frederick Christian Swartz. Swartz was first a Danish missionary, but he afterwards entered the service of the S.P.C.K. Hyder Ali held him in high esteem, as the only trustworthy European available, and entrusted him with despatches. Swartz was allowed to pass unmolested in times of war, 'for he is a holy man and means no harm to my Government.' He died on February 13, 1798.

In the centre aisle of the Church is the tomb of Vice-Admiral Sir Samuel Hood, who commanded the 'East Indies Fleet'; he died on Christmas Day, 1814. He came of a family of illustrious sailors, while his wife was renowned for her lion-shooting exploits in India.

Another tablet of interest is one on the south side of the Church, in memory of Sir Barry Close, who rendered distinguished service at the siege of Seringapatam in 1799, and was afterwards Resident in Mysore. Above this tablet is a fine piece of work by Flaxman, in memory of the Rev. Richard Leslie, Chaplain of St. Mary's, who died in 1804.

Over the altar is a large picture of the Last

Supper which is ascribed to the school of Raphael. It is said to have been seized by the British when they captured Pondicherry from the French in 1761.

The organ is the fifth which has been placed in the Church. The first of the series was installed in 1687, the present one in 1894. The second organ travelled a good deal. It was removed by the French from Madras to Pondicherry, then it was recovered and brought back to Madras, after which it was transferred to Calcutta.

The Church Records. The records of the Church contain many interesting documents; which may be seen on application to the Chaplain. There is a Bible dated 1660, which belonged to Streynsham Master, who was once Governor of Fort St. George, and took a leading part in the founding of St. Mary's. Another interesting document is a Prayer for the East India Company dated 1694, which was sent out by the Bishop of London for use in the Church. The Church Registers take us back to the consecration of the Church in 1680. The first register is a parchment

copy, made in 1739, of the original register. The registers give a complete record of the Church, except for the three years, 1746-49, when Madras was in the possession of the French. The first marriage entry is that of Elihu Yale to Catherine Hinmers on November 4, 1680. Another marriage entry of interest is that of Robert Clive to Margaret Maskelyne on February 18, 1753. The first baptism was performed on the opening day of the Church. Job Charnock, the founder of Calcutta, is also mentioned in the registers. He rescued by force a Hindu widow who was about to commit suttee ; by her he had three children, who were all baptized in St. Mary's.

- The minutes of the Vestry meetings are of great interest. One curious extract deals with the question of small-pox in 1764 as follows :—

'Upon considering the happy success Inoculation has everywhere met with, and the many lives, under Providence, it has been the means of preserving—and the general observation that the best sort of small-pox is therefore produced, the danger next to nil and the recovery easy, it is agreed to desire the Surgeon

attend the Hospital, when the season is most proper, to inoculate such Charity children as have not yet had the small-pox.'

Another document of some importance is a copy of Clive's despatch to Lord Pigot, Governor of the Fort, with a plan of the battle of Plassey.

The Church Plate. The Church possesses some fine plate. There is the Yale alms dish, embossed with the Yale coat of arms, already referred to ; it was given to the Church in 1687. The Goldsborough plate, presented in 1689, was made to fit inside the font to form a silver lid. There is also a fine Danish plate from the Danish Mission at Tranquebar, and a Danish wine flagon and a gold-plated individual communion set. One composite chalice is of special interest : the stand is a French chased silver candlestick, the bowl is of English beaten silver work, while the lid is of Indian design and workmanship.

There are also a number of regimental colours, belonging mostly to disbanded Madras regiments, kept in the Church.

E. J. B.

GOVERNMENT • MUSEUM, CON-
NEMARA PUBLIC LIBRARY AND
ORIENTAL MANUSCRIPTS
LIBRARY

IN Pantheon Road, next to the Maternity Hospital, in a group of red brick buildings, are housed the Government Museum and Con-nemara Public Library. Both are open to the public from 7 A.M. till 5 P.M., and the latter half an hour later in the cold weather and an hour in the hot weather, except on Fridays when both are closed throughout the day and after 12 noon on the first Saturday of every month when the Museum is reserved for ladies only and the Library is closed.

The ground floor of the building nearest the road, to the front of which the Museum Theatre is attached, is devoted on one side to prehistoric antiquities, and on the other to an interesting collection of old arms, mostly from the Madras

Arsenal and Tanjore Armoury. Above are galleries containing collections illustrative of the ethnology of the Presidency, and a large collection of South Indian metalwear, the latter including articles used in household and temple worship, and an exceptionally fine set of Hindu images together with a few Buddhist ones.

The next building contains the Connemara Public Library. The Oriental Manuscripts Library is at present housed in a small building at the back of the Museum. It is ultimately to be amalgamated with the University Library, now temporarily located in the Senate House.

The third and last building contains the rest of the Museum collections. The centre and south-western wing are devoted to Zoology, the north-western wing to Geology and Botany, and the north-eastern wing to Economic Botany and Geology on the upper floor, and to Archæology on the ground floor. Special attention may be directed to the collection of South Indian birds and fishes, the former including several groups mounted with their nests in natural surroundings; the collection of timbers and building stones; the old hand painted and

printed palampores at present, temporarily housed in the Economic gallery ; and the fine collection of sculptures from the ancient Buddhist stupa at Amaravati on the bank of the Kistna river, depicting scenes from Indian life of about two thousand years ago.

F. H. G.

THE VICTORIA TECHNICAL INSTITUTE.

THOSE wishing to see a representative collection of the metal, ivory, wood and textile art products of South India will find one in the Victoria Technical Institute, Pantheon Road, Egmore. It is open to the public daily from 8 A.M. to 6 P.M. except on Sundays and such other public holidays as are observed by the Madras Trades Association.

This Institute was founded by money publicly subscribed on the occasion of the Jubilee of Queen Victoria in 1887, and had for its object the spread of technical education throughout the Madras Presidency. On the death of the same Queen further subscriptions were raised and, with assistance from Government, a beautiful building was erected wherein to display and expose for sale examples of the ancient art industries of the Presidency, in the hope that by

providing a convenient market they might be saved from the extinction with which many of them were threatened. The Institute is governed by a council, partly elected by its members and partly nominated by Government, and is thus a public trust for assisting the craftsmen to earn a decent livelihood.

The main object of the Institute is to assist the old indigenous industries, but it has never been possible to separate these from their modern developments, and from handicrafts developed by missionary and other philanthropic institutions. . As a result of the Women's Work Exhibition held in Madras in 1919 a committee of ladies was therefore formed in 1920 to assist the council of the Institute in the encouragement of women's industries, chiefly embroidery and lace. Their show-room will be found on the right of the entrance to the main hall.

As the Institute exists solely to provide the craftsmen with a reliable market, and has no dividends to pay, prices are fixed with only the small margin of profit needed to prevent it from working at a loss, and no reduction can be made on the figures marked.

The metal work, besides spoons, vases, trays and other vessels of brass, copper and silver manufactured in Madras city and other parts of the Presidency, includes animals of brass or silver (the latter suitable for menu holders) from Madura, flexible brass fishes from Ganjam, mixed metal work (copper and silver on brass) from Tanjore, ornamented brass vessels on a basis of cocoanut shell from Quilandy, various articles composed of replicas of old silver coins from the Malabar coast, and silver images of Hindu gods from Mysore.

The ivory work includes images of Hindu gods, powder boxes, paper knives, etc., from Trivandrum, and boxes of sandalwood overlaid with delicate designs in ivory from Vizagapatam. When work of good quality can be obtained ivory inlaid work from Trivandrum and Mysore is also stocked; but, though the designs are beautiful, putty is as a rule freely used, particularly in Mysore, to hide bad workmanship, and the Institute refuses to stock work of such poor quality in order to discourage it.

The wood work includes sandalwood carving from Mysore, carved furniture from Madras,

Madura, etc., toys from Channapatna, Kondapalli and Palghat and lacquer work from Kurnool. Cane furniture is also stocked.

Textiles, in addition to embroideries and other women's work from all parts of the Presidency, include cotton prints from Masulipatam and Vaniyambadi, hand painted cotton cloths from Karuppur and Kalahasti, wax dyed cotton cloths from Karuppur, muslins from Madura, and silks from Madura, Salem, Tanjore, etc., as well as scarves, saris, etc., from Madura, Salem, Kumbakonam, etc. Also mats of grass and of cocoanut fibre, druggets and carpets.

F. H. G.

MAHABALIPURAM OR 'SEVEN PAGÓDAS

AT the village now generally known as Mahabalipuram or Seven Pagodas, picturesquely situated in rocky country a little more than thirty miles south of Madras, are some of the finest rock carvings and oldest and most interesting temples of south India. .

The earliest South Indian Hindu temples now remaining are caves excavated in the solid rock by the Pallava King Mahendra I. Towards the middle of the seventh century he was succeeded by his son Narasimha I, also known as Mamalla or Mahamalla, and it may be to him that Mahabalipuram owes its name as well as most of its temples. There is reason to believe that it was the port for Conjeevaram, the capital of these kings, and that it was the Malanga mentioned by Ptolemy. It may not improbably, also, have seen the departure

of some at least of the Hindu colonists of the Malay Archipelago. Here Mamalla developed his father's style of architecture, carving numerous temples, both in the form of caves and free standing, from its rocks. Its name, consequently, it has been suggested, may have been changed at this time to Mamallapuram or Mahamallapuram. Of this the modern Mahabalipuram is presumably a corruption with which the legend of Bali has naturally been associated. After Mamalla's death his successors of the same dynasty continued for some time to construct temples here of the same type.

The remains of the palace of these early kings can still be seen, on the summit of the plateau north-west of the modern lighthouse, where there is a thick deposit of brick debris and masses of broken concrete as well as the terraced footings of foundations. The buildings were evidently made of perishable materials. Near these remains is a polished slab of rock with a lion above it that seems to have been made for a throne, and a stone cistern known as Draupadi's Bath.

Mamalla's free standing temples have a

unique interest architecturally, being the oldest such temples in South India, and the starting point, so far as we can now identify it, of the Dravidian style of temple architecture. Though free standing they are all monolithic, being carved out of solid rock. The best examples are the group known as the Five Rathas, from the local legend which regards them as the cars of Draupadi and the five Pandava Kings, though the sculptures and an inscription on one of them prove them to be in reality a group of Saivite temples.

The Parvati temple, locally known as the Draupadi Ratha, is the smallest and simplest. Apart from its ornamentation, it is evidently a copy in stone of an ordinary square hut with a thatched roof supported by curved bamboos, and its shape is identical with that of the buildings in which the city walls end beside the city gateways depicted about five hundred years earlier in the sculptures from the Buddhist stupa at Amaravati, now in the Madras Museum.

The designs of the other four temples appear to be based on those of Buddhist monasteries and assembly halls. Buddhist monasteries com-

monly consisted of a central court surrounded by the monks' cells. Some, however, are known to have been several storeys high and to have been supported on pillars arranged like those of an ordinary Hindu mandapam ; and the ground-floor sometimes covered so large an area that it is scarcely possible that the upper storeys could have been of equal extent. Probably successive storeys were smaller and smaller, giving the building a pyramidal form. That the pyramidal temples of the Pallava period were suggested by such monasteries seems to afford the most probable explanation of their origin. In these temples the parapet walls surrounding each of the upper pillared halls are decorated with a number of miniature pavilions, probably representing the monks' cells, often with carved human faces looking out of their horseshoe-shaped windows, while the halls themselves become a series of niches in which figures of deities are represented. The so-called Dharma-raja and Arjuna Rathas are of this type, and to them the more modern forms of shrine, or vimana, in a Dravidian temple can be traced back.

Buddhist assembly halls ordinarily contained a stupa, or sometimes a figure of Buddha, at the end opposite to the entrance, and the wall was carried round this in a semicircle. This form was adopted for the temple now commonly known as the Ratha of the twins Nakula and Sahadeva, though the ornamentation is uniform with that of the pyramidal temples, recalling a monastery of several diminishing storeys. The remaining temple of the group, which is known as the Bhima Ratha, is of the same general type as the Ratha of the Twins but has both ends straight. A structure similarly decorated might well be built over a gateway as an ornamental modification of the fortifications, illustrated in the carvings from the Amaravati stupa already referred to ; and this is evidently the origin of the enormous gopurams which form such a conspicuous feature of more recent temples of the Dravidian style.

As a fine example of a somewhat later monolithic temple, carved by Parameswaran I, Mamalla's second son, attention may be directed to the Ganesa Ratha, which will be found to the north-west of Arjuna's Penance (see below).

The rock carvings are mostly in the cave temples. Statues which may represent contemporary Pallava kings can be seen (by Hindus only) to the south-west of the lighthouse in the Varaha Cave, over which a small temple has been constructed. But the best known carvings are the sleeping Vishnu, and Kali slaying a demon, which will be found a little to the south of the lighthouse in the rock surmounted by the conspicuous little Olakkan-neswara Temple ; Krishna sheltering cowherds from rain sent by Indra, in the cave temple facing the village ; 'Arjuna's Penance' in the open beside it, and the boar and dwarf incarnations of Vishnu, and the Trimurthi in temples in the rocks behind these. Further north will be found the remarkably balanced natural rock known as Krishna's Butter Ball.

The largest of the rock carvings is also the most puzzling. It is locally known as Arjuna's Penance ; but several authors have pointed out that all the figures face the deep cleft that extends down the rock at some distance from the figure of the ascetic, who thus does not form the centre of the picture. This has led to the

suggestion that the ascetic is not Arjuna but Bhagiratha, and that the cleft represents the Ganges descending from heaven. Unfortunately for this theory, Siva is standing on the side of the ascetic farthest from the cleft, where he could not possibly entangle the water in his hair. From his posture he might well be granting the ascetic the boon for which he had been praying and this would fit well with the story of the way in which Arjuna received from Siva the arms he required for the great battle. Professor Krishnaswami Aiyangar has suggested that three scenes are combined in the picture to the left of the cleft. Below is Arjuna as an ascetic beside a small shrine of his traditional God Vishnu. Above are Siva's boar hunt to the left and Siva offering his boon to Arjuna to the right. The whole of the right half of the picture can then be taken to represent animals and celestial beings watching the scenes depicted on the left.

The Shore Temple and the Olakkanneswara Temple, like the Pallava temples of Conjeevaram, differ from the temples of Mamalla and his immediate successors in being built of cut

blocks of stone instead of being carved out of the solid rock. They date from towards the end of the Pallava period and were probably erected by Rājasimha, (= Narasimha II, son of Paramaswaran I), who came to the throne towards the end of the seventh century.

The cave temples of Saluvankuppam, situated in a clearing among casuarina trees about two miles north along the coast from the Shore Temple, are well worth a visit by any one who has time to get there, the more striking of the two being decorated with horned lion heads, from which it has come to be known as the Tiger Cave. Both inscriptions, and the decoration of pilasters with rearing lions, show these temples to be of about the same date as the Shore Temple.

F. H. G.

THE TEMPLES OF CONJEEVARAM

CONJEEVARAM or, more properly, Kanchipuram, can be traced back to about the third century A.D., when it was already the capital of a king belonging to the Pallava dynasty. It is probably the only place in which the development of the Dravidian style of temple architecture can be traced from Pallava times onwards in a single town.

An inscription by the Pallava King Mahendra I, who came to the throne about A.D. 600, shows that before the days of his rock-cut temples it was customary to build temples of 'bricks, wood, metals and mortar'; and stone pillars from a temple which he constructed, presumably in this manner, have been built into the Pournami Mandapam of the Ekambaranatha Temple. These are possibly

the oldest Hindu architectural remains in South India, antedating as they do his son Mamalla's temples at Seven Pagodas and perhaps his own cave temples also. The oldest temples still standing at Conjeevaram in their original form date, however, only from the later part of the Pallava period, and are contemporary with the Shore Temple at Seven Pagodas.

The largest of them is the Kailasanatha temple, built by Narasimha II, also known as Rajasimha, who came to the throne about A.D. 690. The entrance is through a gateway surmounted by a small gopuram. This gateway leads into a court which, though of approximately the same date as the main building, was evidently not part of the original design; and the position of the original entrance is occupied by a shrine still surmounted by a larger gopuram than the outer one instead of by a conical vimana tower. But the vimana tower over the central shrine rises to a much greater height than either of the gopurams. The corbels are rounded as in all Pallava temples. Squatting lions are used as supports for the pillars and rearing lions to decorate the pilasters, as in the

Shore Temple at Seven Pagodas, which was probably built by the same king.

Four smaller Pallava temples are situated not very far from the railway station. The most important of these is the Vaikunta Perumal Temple, which was probably built either by Rajasimha's son Parameswaran II or by the latter's successor Nandivarman Pallavamalla. It is chiefly famous for the scenes from contemporary history carved on its walls. Unfortunately none but Hindus are admitted to see them.

A mile or two beyond the Kailasanatha temple, across the Vegavati river, lies the village of Tiruparutikunram. Its temple, which belongs to the Jains, is of exceptional interest as it is not, like most other South Indian temples, all in one style of architecture, but in three distinct styles representing respectively the Pallava, Chola and Vijayanagar periods, (roughly A.D. 600-850, 850-1350 and 1350-1600). A small building in the garden adjoining the main temple is clearly Pallava work, with rounded corbels and rearing lions of the type found in the Kailasanatha temple. The main

temple dates, as is shown both by inscriptions and by architectural style, from early in the Chola period and to it a mandapam has been added in the Vijayanagar period, the ceiling of which is decorated with paintings illustrating the lives of some of the Jain saints. In the Chola temple the simple rounded pillars are surmounted by square corbels from which a triangular piece has been cut away on either side, a type still in common use at the present day but unknown before Chola times. In the Vijayanagar mandapam fluted pillars bear cobra-hood ornaments at their base and are surmounted by corbels carved as lotuses. These are features still in common use, but first introduced in the latter part of the Chola period. The lotuses on the corbels, though often indicated in the later Chola period, were not properly developed before the Vijayanagar period. In more recent buildings they tend to become more and more elongated until finally they are transformed into plantain flowers.

The three largest and most sacred temples of Conjeevaram, and most of its innumerable

minor ones,† date from the Vijayanagar period (about A.D. 1350-1600). Only the three largest can be referred to here.

The towers of the Ekambaranatha temple are conspicuous on one's right as one enters the town by the direct road from Madras (*via* Sriperumbudur, the birth-place of Ramanuja). These towers are all gopurams built over gateways, the vimana towers over the shrines being of insignificant size. They are of stone below with brick and plaster above, stone rarely if ever being used for the upper storeys of such towers. In the Pallava period the vimana tower always dominated the gopurams as has already been noted in the case of the Kailāsanatha temple. In the early Chola period this continued to be the case and vimana towers of enormous size were erected, of which that of the Tanjore temple is the finest example. In later Chola times, however, the fashion changed and the gopurams became the dominating feature, the vimanas being allowed to remain of quite small size, a fashion which has continued to the present day. Since however, the finest Chola gopurams were already so large that it was almost impos-

sible for later builders to erect finer ones, the builders of the Vijayanagar period, turned their special attention to elaborate carving, for the display, of which the mandapams or pillared halls gave greater scope than the gopurams; and the wonderful workmanship of these halls is usually the most striking feature of their temples.

The greater part of the Ekambaranatha temple is in a somewhat dilapidated condition but the colossal carved stone pillars on either side of the main gateway are very fine. A good general view of the temple can be obtained from the top of the gopuram over this gateway. The main shrine of the temple contains the Earth •Lingam. Though sacred to Siva, no temple to his consort Parvati is found within its precincts. Instead she is worshipped under the local name Kamakshi in an entirely separate temple not very far away. This temple is built in the same style as the Ekambaranatha, though its gopurams are not nearly so big. The mandapam bears some beautiful carving especially round the plinth, but is in a dilapidated condition.

The Varadaraja temple of Little Conjeevaram, which also dates from the Vijayanagar period, is the most magnificent of all the Conjeevaram temples. The main entrance is through an immense gopuram. On the opposite side of the temple, so far away as to be obscured from view by other buildings, is a still finer one ; but this, being under a curse, cannot be used for entering the temple on ceremonial occasions. Between these two gopurams is a walled enclosure containing the central shrine and between the entrance and this enclosure are two graceful little shelters each supported by four tall slender pillars. To the left of these is the principal mandapam and beside this a fine tank with a couple of small mandapams in the middle. The principal mandapam is most wonderfully carved. At each corner there is a stone chain, carved from a single block. At the corner nearest the temple entrance there is a remarkably realistic group of pigeons and cats at the edge of the roof. And the monolithic pillars by which the roof is supported are all of them richly decorated with mythological and other figures, while the lotus corbels above them are

well carved examples typical of the Vijayanagar period. This temple is also famous for its jewels, some of which were presented by well-known men such as Clive and Tippu Sultan.

F. H. G.

INDIAN INSTITUTE OF SCIENCE, BANGALORE

AMONG the many patriotic benefactions of the late Mr. J. N. Tata, none has evoked more interest and admiration from scientific men than the foundation of the Indian Institute of Science, Bangalore. Although most unhappily he died before the conception took physical shape, the loyalty and generosity of his two sons, Sir Dorabji and (the late) Sir R. J. Tata made it possible to admit the first students on July 24, 1911, by which date the departments of general chemistry, applied chemistry and electrical technology had been constructed and equipped. Ten years later, the functions of the applied chemistry department having been assimilated to those of general and organic chemistry, a new department of bio-chemistry was inaugurated, in recognition of the numerous economic problems peculiar to India which group themselves naturally in this branch of knowledge.

The Indian Institute of Science is a post-graduate institution having for its object the promotion of advanced study and original research with special regard to the educational and economic requirements of India. At the time of its foundation, the opportunities offered to post-graduate students for instruction in methods of research at Indian universities with a few exceptions were slender ; and although the proceedings of the Indian Science Congress provide increasing testimony to the great improvements in this respect effected in the past fifteen years, it is gratifying to record that the result has been to widen and stimulate the desire to enter the Institute, close upon five hundred applications having been received in the three years 1925-28. Thus the need for such an institution as estimated by the Tata family has been amply demonstrated.

The system of training in the three departments of chemistry consists in a preliminary course of lectures and experiments designed to bridge the gap between completion of studies for the degree and embarkation on research : as soon as possible thereafter the student is intro-

duced to some chemical problem, and after devoting himself to this for a stated period may be awarded the Associateship. The laboratories have the ordinary equipment of steam, gas, high-pressure water, vacuum, current (direct and alternating), besides including a comprehensive collection of apparatus for physico-chemical work and precise measurements. A liquid-air machine and a hydrogenation plant, with various types of stills, furnaces, extractors, autoclaves, grinders and crushers facilitate investigation of natural products and research on a semi-industrial scale. In the bio-chemistry department sterilisers, centrifuges and fermentation plant have been added to the foregoing ; a laboratory devoted solely to micro-analysis, and a cold chamber, are also available. Weekly meetings of students and staff are held for discussing subjects of current chemical interest, or the reading of papers describing inquiries conducted at the Institute. During the long vacation, facilities are offered to members of teaching staffs in other Indian scientific institutions who may wish to pursue their researches while on leave.

In the department of electrical technology the plan of instruction has been modified to supplement the training of applicants who aspire to responsible positions as electrical engineers, and for those who are well-grounded in mechanical engineering and higher mathematics follows a regular two years' course, at the close of which a certificate is awarded. When accommodation is available, graduates in physics and mathematics may be admitted, but are required to undergo a special preliminary course of one year at an engineering college. Arrangements are made for the long vacation to be spent in some engineering works, generating station, or power-house, to give wider practical experience and to study the ordinary routine of a commercial enterprise. The purpose of the chemistry colloquia is fulfilled in this department by the Electrical Engineering Society, which holds meetings at regular intervals, and publishes a journal entitled 'Electrotechnics'. A valuable and up-to-date collection of electrical machinery, plant and apparatus has been assembled, and ample opportunities provided for studying (1) the properties of direct and alternating current

circuits, (2) the generation, transmission and distribution of electrical energy for power, light and traction, (3) machinery and equipment for traction, (4) the theory and design of electric machinery, and (5) problems of insulation and high tension insulators. Lectures and classes in some subjects of mechanical engineering, a drawing-office for the design of machinery and the lay-out of electrical schemes, and a workshop for the construction of apparatus required in research and the maintenance of existing appliances, are also provided. A notable recent addition to this department is a section for the study of electrical communication engineering, embracing telegraphy and telephony, modern high-speed automatic signalling and recording by wireless and line radio systems, direction and position-finding.

The library is a specialized one, consisting principally of the journals of different nationalities describing the details of current researches in chemistry and engineering, and numbering over 150. These, with some advanced textbooks, comprise over 14,000 volumes and there is also a complete collection of Indian Patent

Office specifications. To meet the requirements of students unfamiliar with French and German, classes in these languages are given by the librarian. The amenities of the hostel have been materially extended by the Students' Gymkhana Club, the gift of Sir Dorabji Tata, and athletic needs are met by a gymnasium, four tennis-courts and a cricket, football and hockey-ground.

In selecting a site for the Institute it had to be recognized that in India, owing to the great distances which separate the large cities and centres of industry, it is not practicable to secure that frequent personal association between workers in the several fields of intellectual activity enjoyed in European countries and the United States. Consequently, more weight was given to climatic conditions than to the possibility of approximating to some industrial area. The location finally chosen is 3,000 feet above sea-level and is probably the most favourable that could have been found in this country, it being possible to work in Bangalore during the greater part of the year without undue discomfort. The Government of H.H.

the Maharaja of Mysore generously allocated an area of 370 acres about four miles from the City, and on about one-half of this have been accommodated the laboratories, the hostel and bungalows for the teaching staff, disposed along the sides of a rectangular maidan dominated from one end by a handsome granite building containing the library, offices and council chamber, and crowned by an imposing tower, one hundred and sixty feet in height. Fifty yards from the main entrance there stands a beautiful monument, the main feature of which is a striking bronze statue of the founder, the late Mr. J. N. Tata. This was unveiled by H.H. the Maharaja of Mysore in 1922.

This description of the Indian Institute of Science has hitherto been strictly quantitative : but in dealing with the considerable volume of results already achieved it is not practicable to follow this method. In one sense, the task of building character, of inculcating clearness of thought, habits of industry, perseverance in the face of disappointment and precision of craftsmanship, is the most important one assumed by the Institute, which has now distributed

throughout the country a substantial body of men trained in the art of making and appreciating knowledge and in the technique of solving a problem. It is not possible to attach a definite estimate of value to this particular achievement, however, and it is therefore desirable to indicate some of the more material benefits to Indian economy which may be claimed as a direct outcome of the founder's munificence.

Although commonplace from a scientific standpoint, the most remunerative industrial item has been to translate the manufacture of sandalwood-oil from Germany to India. This essential oil, obtained by distilling the finely divided wood in a current of steam, is highly valued medicinally and in perfumery. Arising directly from experiments conducted at the Institute, two sandalwood-oil factories have been successfully established by the Government of Mysore ; the profits from these alone would have amply covered the whole cost of the Institute, and indirectly the general methods of distilling essential oils throughout the Indian peninsula have improved. Another profitable outcome

of experiments in the departments of general and organic chemistry has been to elaborate a process for the manufacture of white-lead, required in large quantities for producing paint : this has now been extended to the commercial scale in Bangalore, where a factory has been established to produce a substantial annual tonnage. Similarly practical inquiries into the use of local oils for soap manufacture have led to the foundation of a factory in Bangalore where high-class soaps are made under the auspices of the Government of Mysore, and experiments on the composition of lead-pencils have resulted in the manufacture of these articles in Madras.

Experiments on the by-products obtainable from different varieties of woods when distilled have been useful to the Bhadravati iron works, and the tanning industry has been assisted by a process for converting Indian chromite into sodium dichromate. Considerable improvements have been effected in the products from solar evaporation of sea-water and pit-brine, in the refining of saltpetre and in the recovery of caffeine from tea-waste. Work with fixed oils

has comprised experiments on refining and hardening, the production of ghee substitutes, determination of the constitution of some less-known oils, and an examination of the relation between iodine values and refractive indices of hardened oils. Many of these inquiries await more favourable economic circumstances for commercial development, and conversely others have served the financially valuable, although negative, purpose of preventing fruitless outlay of substantial capital on enterprises predestined to failure.

In a manner resembling that outlined in the foregoing paragraphs, the departments of applied chemistry and subsequently that of bio-chemistry may be correlated with definite economic advantages to India. From preliminary fermentation experiments conducted at the Institute the plans for the acetone factory at Nasik were elaborated, and former students remain in charge of the operations by which alcohol is now produced instead of acetone. The system of sewage treatment and water-supply prevailing at Jamshedpur is based on advice proceeding from the Institute, and a

well-equipped laboratory for the necessary bacteriological and chemical work is conducted by former students. For many years past, the principles underlying bacterial and chemical changes involved in the activated sludge process have been closely studied, and a considerable variety of changes depending on fermentation examined with a view to utilizing waste-carbohydrate resources for producing power alcohol. Much attention has been given to the cultivation of lac, the habits and requirements of the lac insect, the recognition of its parasites and the preparation of the resin for market purposes : a considerable area of trees appropriate to the propagation of lac insects has been made available to the Institute by the Government of Mysore.

The department of bio-chemistry is also making a concerted attack on the problem of spike disease in sandal, and for this purpose a special grant has been made to the Institute by the Government of Madras and the Chief Commissioner for Coorg. The general principle underlying this campaign is to make a rigid analytical comparison between the healthy and

spiked tissue in respect of chemical composition, diastatic activity, chemical and physical properties of the sap, and the prevailing soil conditions : transmission of the disease through grafting and budding concurrently with the influence of different host-plants on the growth of healthy sandal are being studied in field and laboratory. Other matters having an economic bearing and now engaging the attention of this department are (1) a systematic survey of the vegetable proteins of Indian foodstuffs, (2) the isolation and study of enzymes, and (3) problems connected with fixation of nitrogen in soils. The papers describing the foregoing investigations, together with those proceeding from the department of electrical technology are published in the Journal of the Institute, of which approximately 170 parts have now been issued. These include also many contributions of purely academic interest which have served the purpose of introducing their authors to methods of research in the respective branches.

In concluding this review of the contribution to the educational system of India and to the development of her potential industries made

by the Institute, it is proper to mention the names of those who have been more conspicuously responsible for moulding its technical activities. Dr. M. W. Travers, the first appointed director, conceived the generous lines on which the Institute is planned and inaugurated the work of the chemistry departments, while the foundation of a notably sound and thorough system of training in the subject of organic chemistry is due to Dr. J. J. Sudborough, who served the Institute during fifteen years and retiring in 1925 was succeeded for two years by Dr. J. L. Sirhonsen. In 1916 Dr. H. E. Watson, having rendered able service as assistant professor of general and inorganic chemistry was appointed to the professorship which he still holds ; during his tenure the department has undergone consistent development. Dr. Alfred Hay became the first professor of electrical technology in 1908, and founded the admirable system of training in that subject to which allusion has been made. He was succeeded by Professor J. K. Catterson-Smith who has very substantially increased the equipment, and has widened the scope of the

department by organizing the new section of electrical communication engineering. On the retirement of the late Professor Rudolf from the department of applied chemistry, Dr. G. J. Fowler assumed the duties and in 1921 became professor of bio-chemistry, successfully developing this branch until 1924, when he was succeeded by Dr. R. V. Norris, who has made valuable additions to the opportunities and activities of the department. The work of these officers has been facilitated and very materially assisted by the loyal co-operation of their younger colleagues, of whom the great majority have been Indian, and of whom it is gratifying to note that some are former students who have returned to the Institute after gaining widened experience elsewhere. Thus it is reasonable to hope that, the initial obstacles always confronting a new foundation having been surmounted, the Indian Institute of Science is destined to fulfil the noble aspiration of its founder as an All-India scientific research centre.

M. O. F.

THE VEGETATION OF MADRAS

To any one coming in to Madras from Northern India through Bombay, probably the most striking feature of the country is its greenness. From the black cotton soil thinly sprinkled with Neem or Margosa (*Melia azadirachta*) and Babul (*Acacia arabica*) which covers the Deccan plateau, he drops suddenly to the richer red soil of the Coromandel plains, where cocoanut plantations, rows of palmyra palms and luscious paddy fields give to the whole country a refreshing green colour.

From Calcutta the traveller by the Mail train enters the Madras Presidency at the Chilka Lake and, running never far from the Eastern Ghats, passes in turn through rich paddy fields, barren stretches of wild date palm, tobacco fields and tall sugarcane; skirts in the early morning hours the backwater of Pulicat where the Dutch made their headquarters and crosses

the Ennur estuary the creeks of which are lined with the mangrove (*Avicennia officinalis*) whose upright breathing roots can be seen rising thickly from the mud. As he approaches Madras, scattered plantations of grey-green feathery casuarina (*Casuarina equisetifolia*), force themselves on his attention. This cultivation dates from the early sixties, when under Cleghorn's advice plantations were started for fire-wood, and they have been the means of saving the indigenous trees and shrubs. They owe their success on these barren sandy shores to root-nodules akin to those of the *Leguminosae*.

Near Madras and especially to the south, there are low rocky hills covered with a thorny evergreen scrub vegetation which is peculiar to the Coromandel coastal area. The nature of this vegetation is perhaps due to the distribution of the rainfall. In contrast with the rest of India, the Madras coastal plain receives most of its rain in November, when up north the dry weather has already set in. But important showers also fall during the South-West monsoon and in April, and the more even distri-

bution of rain' which these give, together with the humid sea breeze, accounts for the jungle being ever-green, though the total rainfall of under 50 inches does not allow of it being luxuriant. Chief among the woody elements of this flora are *Zizyphus xylocarpa*, *Zizyphus oenoplea*, *Carissa carandas*, *Maba buxifolia*, *Gymnosporia emarginata*, (with red arillate seeds), *Capparis zeylanica*, *Capparis horrida*, *Mimosa hamata*, *Pterolobium indicum*, *Hugonia mystax*, *Ventilago maderaspatana* and *Randia dumetorum* (with fruits like the guava). Among the fleshy plants are *Euphorbia antiquorum* (with three angled twisted stem), *Sarcostemma brevistigma* (Asclepiadaceae) which has no leaves, *Vitis quadrangularis*, and *Caralluma attenuata*,—while the introduced *Opuntia* is rampant everywhere. In the scrub near Tirukalukkundram and on the road to Seven Pagodas are found the dwarf, nearly stemless, spiny, Date Palm, *Phoenix farinifera*, with *Cycas circinalis*.

In the tanks and paddy fields the Babul (*Acacia arabica*), thrives and one may come across thickets of this tree and of the local date

palm (*Phoenix sylvestris*) whose fruit is palatable only to small boys. This latter fruit is well developed in the compound of Government House at Madras.

After the North-East monsoon, all the pools and tanks fill up and the usual aquatic vegetation is seen. Among the interesting plants must be mentioned *Isoetes coromandelina* which grows in the bigger tanks near the bank with its stem imbedded in the mud and the leaves sticking out of the water—(the plant may easily be mistaken for a sedge *Limnophila gratioloides*) with highly dissected leaves below the water and entire leaves above, in the smaller pools *Neptunia Oleracea* with floats of spongy tissue round the stem and sensitive leaves, and *Jussiana repens* (its spongy roots aid in floating and aeration). The introduced Water Hyacinth, *Eichhornia speciosa* with swollen petioles and beautiful flowers is seen sometimes.

The strand flora merits attention, and, though in the limits of the city it is naturally suppressed (by the feet of bathers and others enjoying the sea breeze), there is something of interest even here, and a few miles north and south the

vegetation shows normal development. Along the Marina, *Ipomaea biloba*, *Cyperus arenarius*, *Pupalia orbiculata*, *Launaea pinnatifida* (Compositae), *Hydrophyllax maratima* and occasionally *Canavalia lineata*, make low hillocks where they bind the sand: but, at San Thome and better still at Elliot's Beach, south of the Adyar river (about six miles from the Fort), there are regular dunes covered with them and with *Spinifex squarrosus*. On the flat sand behind these dunes at Elliot's Beach are numerous plants characterized by a very low spreading habit, *Sesamum prostratum* (Labiatae), *Perotis Geniosporum prostratum*, (Labiatae), *Perotis latifolia* (Gramineae) with stems flat on the sand, *Leucas diffusa*, *Indigofera aspalathoides* and *Euphorbia rosea*. Among the erect plants are *Aristida adscensionis*, *Polycarpea corymbos* (Caryophyllaceae) and *Stenophyllus barbata* (Cyperaceae), while the introduced *Vinca rosea* often monopolises large stretches of ground.

Estuarine plants are to be found on the banks of the Cooum and the Adyar. Of minor halophytes we have *Suaeda nudiflora* and *Suaeda monoica*, *Sesuvium portulacastrum*, and

Heliotropium curassavicum (a native of South America). Mangroves are represented by *Avicennia officinalis* which has vertical pneumatophores but not viviparous fruits. Among shrubs common on the bank are *Exacaecaria aghallocha* (Euphorbiaceae), while behind these the common trees are *Cerbera odollam*, *Pongamia glabra*, *Erythrina indica* and *Thespesia populnea*—all having floating seeds or fruits.

In the estuarine region of the Adyar and in the backwaters near it is seen *Halophila oyata* and in the salt marshes behind Seven Pagodas is found *Ruppia maratima*.

A word might be said of the Madras compounds the lawn of which is largely made up of small herbaceous plants like *Justicia procumbens*, *Ruellia Prostrata*, *Tridax procumbens* (South American), *Inoidium suffruticosum*, *Evovulus alsinoides* and *Tephrosia purpurea*. Under shade of trees the West Indian *Ruellia tuberosa* flourishes and makes a beautiful show of pale purple flowers after the July rains.

In open spaces where they are not suppressed are *Tephrosia purpurea*, *Sida cordifolia*, *Cleome*

viscosa, *Tridax procumbens*, *Indigofera enneaphylla*, and *Tribulus terrestris*. An introduced herb which is spreading rapidly during the last few years all along the Madras roadsides and open fields is *Gomphrena decumbens* of Central America.

The Agri-Horticultural Gardens are worth a visit. The Society was founded in 1832, but the present gardens owe their general design to the late Sir Charles Lawson who laid them out in 1889. Robert Wight was one of the early members and Cleghorn, the forester who was chiefly instrumental in starting the plantations of *Casuarina* which supply all the firewood of Madras.

There is a good collection of palms of which we might mention the Royal Wine Palm of the West Indies (*Oreodoxa regia*) which is planted also a good deal in Madras, the Egyptian Doom, the Double Cocconut, *Lodoicea sechellarum* (of the Seychelles Islands) whose growing point after ten years is still underground, and the stemless *Nipa fruticans*. A number of ornamental palms can be seen in the Nursery. In one of the ponds a fine growth of *Victoria regia*

is worth noting. Another interesting plant is the Cannon Ball Tree of Tropical America (*Couroupita guianensis*) with its peculiar hooded flowers and huge fruits like cannon balls. On two mounds are collections of cactoid and other xerophytic plants, among the most interesting of which is *Stapelia grandiflora* whose broad flowers, half a foot across, have a small brown evil-smelling centre ('to attract flies') and concentric lines like a spider's web (as additional attraction? !!!) The Fern House has recently lost a number of species. But among the interesting ferns may be mentioned the fine plants of *Asplenium nidus* (Birds' Nest Fern) and the Climbing Fern, *Staenochlaena palustre*.

P. F. F.
M. O. P.

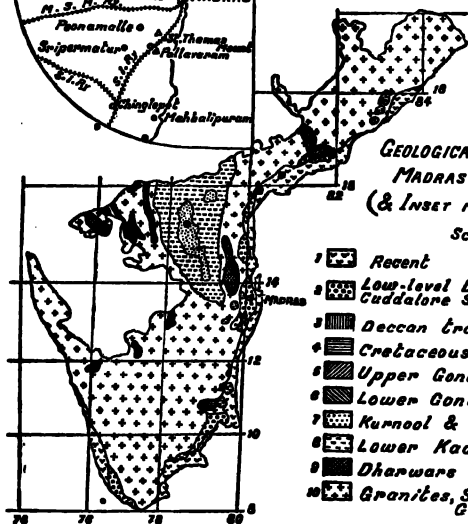
THE GEOLOGICAL STRUCTURE OF THE MADRAS PRESIDENCY WITH A SHORT NOTE ON PLACES OF GEOLOGICAL INTEREST AROUND MADRAS

A GLANCE at the geological map of South India, south of latitude 16° , shows that nearly eighty per cent. of the whole country is occupied by Archaean rocks. The rest of the area is made up of unfossiliferous sedimentary Cuddapah and Kurnool formations, taking the form of a crescent and resting unconformably on the eroded upturned edges of the ancient crystallines ; Lower Gondwana rocks (of Barakar age) in the Godavary basin ; groups of Upper Gondwana patches generally intercalated with marine Cretaceous rocks, along the east coast ; and an isolated outlier of basaltic lava-flow of Deccan Trap age. Fringing most of the afore-



GEOLOGICAL MAP OF THE MADRAS PRESIDENCY (& INSET MAP OF MADRAS)

Scale 1 inch = 160 Miles



- 1 Recent
- 2 Low-level Laterite & Cuddalore Sandstones.
- 3 Deccan trap
- 4 Cretaceous
- 5 Upper Gondwanas
- 6 Lower Gondwanas
- 7 Kurnool & upper Kadapas
- 8 Lower Kadapas
- 9 Dharware
- 10 Granites, Schists & Gneisses

said formations, is a coastal belt of younger Tertiary and recent formations.

The subjoined table gives a summary of the important geological formations of the presidency, and the mineral deposits associated with them. .

The advancement of our knowledge regarding the inter-relationship of the various members of the Archaean group we owe mainly to the labours of Mr. R. B. Foote, who recognized and mapped over large areas of the Dharwar formations; Sir Thomas H. Holland, who discovered the Charnockite family of genetically related pre-cambrian plutonic intrusive rocks, which have a wide distribution in this province, the Elaeolite syenite series occurring at Sivamalai in the Coimbatore District, and gave an exhaustive account of the natural history and economic importance of the Peninsular pegmatites; Mr. C. S. Middlemiss, who described clearly the *ultra basic* intrusions of the Salem District, and the corundum occurrences of the Coimbatore and Salem Districts; Dr. Walker, who mapped the Kondalite series (graphite-garnet-quartz-sillimanite-schists) of Kalahandi

State, which are now known to extend from Bezwada right up to Ganjam, within limits of this province; and Dr. L. L. Fermor, who discovered the manganese-bearing Kōdwite series of Vizagapatam, and made the very suggestive distinction between the Chota-Nagpur and Eastern ghat facies of Archaeans.

ARCHAEAN ROCKS

The Peninsular gneisses which cover the major portion of the country are biotite gneissose granites giving rise to low rounded hillocks, and forming table-lands, in Coimbatore, Wynaad, Bellary, Arcot and Vizagapatam Districts.

The Dharwars have an extensive development in Mysore, and their outcrops are also found in Bellary, Anantapur, Cuddapah, and the extreme northern portion of Salem and parts of Wynaad, Coimbatore and North Arcot Districts. They are preserved in the form of a series of long, narrow, fairly parallel bands, extending from near Belgaum in the southern portion of the Bombay presidency, and from the Kistna river in the Nizam's Dominions,

southward through the Mysore State up to the northern portions of the districts bordering the southern boundary of Mysore. The rocks of the system include Hornblendic and Chloritic schists, Haematitic quartzites, phyllites, and sometimes metamorphosed conglomerates. There is still no general unanimity of opinion regarding the age and lithology of some of the constituent members of the system exposed in Mysore. This system forms the treasure house of most of the minerals of economic value to be found in India. Most of the principal ore-deposits of the country, the metals—gold, manganese, iron, copper, lead and antimony; the non-metallic minerals—mica and corundum; rare minerals—samarskite, columbite and monazite, precious stones—ruby, spinel, chrysoberyl, zircon, garnet, and amethyst; and building and structural materials—granites, marbles, ornamental building stones, and roofing slates are found in the Dharwar rocks.

Charnockites constitute the important hill masses of the presidency, including the Nilgiris, Shevaroys, and Palnis, and also occur as bands in Coimbatore, Salem, Wynaad, South Arcot,

Vizagapatam' and Ganjam Districts. They carry as accessory minerals graphite, ilmenite, and monazite and furnish an inexhaustible supply of building stones and road-metal.

In the Eastern ghat region and, the neighbouring coastal districts khondalites and garnet gneisses take the place of the Dharwar schists, and the normal Peninsular gneiss, while the rocks of the Charnockite series are also generally garnetiferous in this area. Garnet, and graphite are frequently found associated with these rocks in paying quantities.

EPARCHAEAN INTERVAL

A vast interval of time appears to have ensued, after the formation of the Archaeans just described, during which period, they suffered much compression and metamorphism, and were upheaved, to be eroded by atmospheric agencies, into great table-lands, before being depressed below the ocean, to receive as sediments, the succeeding Pwjana group of rocks.

About the end of this Eparchaeon interval,

or during the early parts of the Cuddapah epoch, the Pegmatite dykes of Nellore and Coimbatore carrying marketable mica, and rare and gem-minerals like columbite, samarskite, and aquamarine; the dyke rocks of North Arcot and Salem, the latter carrying chromite and magnetite, were (according to Mr. C. S. Middlemiss) intruded into the Archaeans.

THE PURANA GROUP

The Cuddapah and Kurnool series were mainly mapped by Mr. W. King, and form a great isolated crescent shaped basin, 200 miles long by 100 miles wide in their widest part. They are made up of shales, slates, quartzites, and limestones. The Kurnool series (regarded as of later Vindyan age), rest over the Cuddapahs and they contain at the base, a group of coarse felspathic and ferruginous sandstones (Bangana-palle beds) some bands of which are diamondiferous. Volcanic action was common during lower Cuddapah times, as is clear by the abundance of lava flows, and tuff-beds in the type area. These rocks locally carry manganese

ores, and argentiferous galena occurs as nests, stringers, and irregular veins, metasomatically replacing the limestone members of the series.

LOWER GONDWANAS

The succeeding system, the first in the presidency that is fossiliferous, the Lower Gondwana formation is a characteristically freshwater deposit and is exposed on the left bank of the Godavary valley, thirty to forty miles W.N.W. of Rajahmundry. It includes, near Bedadanol, five square miles of coarse felspathic sandstones, with carbonaceous shale seams. Attempts, hitherto made by the local Government, to locate workable seams of coal in this region by boring have proved futile.

UPPER GONDWANAS

A few isolated outcrops of upper Gondwanas occur in a narrow strip of country between the gneisses and the east coast. In these outliers are seen both plant fossils and estuarine

molluscs, the various patches roughly corresponding in age to the Rajmahal and Umia beds. They are principally found near Rajahmundry, Ongole, Madras and Ukatur (Trichinopoly District).

CRETACEOUS BEDS

In Trichinopoly District, the upper Gondwana rocks are overlain on the eastern side by the marine cretaceous beds, which are richly fossiliferous, most of the organisms being cephalopods and gasteropods.

DECCAN TRAP

- An isolated outlier of volcanic rock of Deccan Trap age occurs on both banks of the Godavary river, resting partly on metamorphics and partly on upper Gondwanas ; attaining the thickness of nearly 200 feet. Near Pangudi village, seven miles from Kovvur station (M. and S. M. Ry.) the basaltic trap rock is clearly seen resting on the top of an impure silicified bed of limestone, containing estuarine molluscs.

CUDDALORE SANDSTONE

The name Cuddalore sandstone is given to the formation stretching interruptedly from Rajahmundry to Tinnevely, consisting of grits and sandstones, dipping gently towards the sea, and containing locally silicified wood in large quantities. The Warkalli beds found on the west coast near Quilon—of variously coloured clays, shales, grits, and sandstones, intercalated with paying seams, and layers of lignite capped by laterite—occupy the same position as the Cuddalore sandstones on the east coast as regards age, which is probably later Tertiary.

LATERITE

High-level laterite is confined to hilly and elevated tracts of the country in the neighbourhood of Bellary, Cuddapah and Vizagapatam Agency and in the Nilgiri and Palni hills and is of good thickness. The low-level variety is of small and inconstant thickness, mostly detrital in character and is found all along the coast, and is extensively quarried as a building stone.

CAVE DEPOSITS

The Billasurgum cave deposits in Kurnool district are encrusted with stalagmite, and contain red marl full of mammalian remains, some of them representing extinct species.

RECENT DEPOSITS

The recent deposits include the *Teris* of Tinnevely and Travancore coasts, the older alluvium of the larger rivers as the Godavary, Kistna, and Cauvery, the coast and deltaic alluvium, the younger alluvium of the present river-beds, the mud-banks of the west coast and the peat-deposits on plateau regions as the Palnis and Nilgiris. The coastal alluvium near Pondicherry has furnished a good artesian water-supply.

LOCAL ALTERATIONS OF LEVEL

Illustrations of minor, more or less local alterations in level, both of elevation and depression within sub-recent and pre-historic

times are given below. In Tinnevely district evidence of recent subsidence is furnished by a submerged forest, and the presence of a thick bed of lignite at Pondicherry some 240 feet below ground-level points to the same conclusions. Evidences of upheaval are furnished by the exposure of raised coral reefs along the coasts (near Pamban) and raised cliffs and beaches (near Cape Comorin).

The sea is practically scouring away the coast line, and encroaching upon land near Vizagapatam, near Royapuram, within Municipal limits of the Madras city, and opposite the Seven Pagodas or Mahabalipuram, thirty miles south of Madras.

The sea has distinctly receded in certain other places notably opposite the Triplicane, and Mylapore divisions of the city and only a few months back, near Aleppey on the west coast, due to the formation of a new mud bank.

The chief geological formations in and around Madras can briefly be classified as follows :—

Beach sands and migrating sand-dunes.

River alluvium.

Laterites (low-level).

Cuddalore sandstone.

Rajmahal plant beds.

Cuddapah outliers and associated Trappean intrusions.

Eparchæan interval.

Charnockite intrusives.

Granitoid gneisses.

Laterite.—Good sections of extensive and fairly thick patches of laterite are well seen (1) near Red Hills (seven miles north-west of Madras), (2) Madavaram village close to Red Hills, (3) along the banks of the Corteliar river, (4) North of Avadi station (M. & S. M. Ry.), (5) South-west of Sembarampakkam tank near Poonamallee, (6) Irumbur near Sripermatūr and (7) opposite Trivellore station (M. & S. M. Ry.).

Cuddalore sandstones.—These occur on the northern bank of the Corteliar river as friable brownish grits, separated from the overlying laterite cap and underlying Rajmahal rocks on lithological and stratigraphical grounds.

Rajmahal series.—According to Mr. R. B. Foote, the Rajmahal beds extend over an area of nearly 1,000 square miles, part of this area,

however, is covered up by younger formations. The Rajmahals are seen as four separate patches at (1) The Sattavedu, (2) Alicoor, (3) Pyanoor and (4) Sripermatpur areas.

Cuddapahs.—The southern outlier of Cuddapahs forms the well-known Naggery peak or nose capping the Archaean gneisses, and doleritic intrusions are common in this area.

Charnockites.—Exposures are seen at (1) St. Thomas' Mount and (2) the adjoining Pallavaram hills.

The Mount is eight miles south of Madras on the South Indian Railway and there is a small hillock on the western side of the Mount, made up of Charnockite in the centre and flanked on both sides by augite-norite.

The Pallavaram hills are situated three miles further south of St. Thomas' Mount on the eastern side of Pallavaram station and railway line (S.I.Ry.). Here there is a central band of norite bounded in succession on the eastern and western sides by Leptynites and Charnockites. Pyrite is abundant near the Leptynite margin, while graphite is found as an original constituent of norite.

The rocks exposed at the Seven Pagodas (Mahabalipuram) are an aplitic variety of Charnockite and they carry quartz crowded with acicular inclusions, and micro-perthitic felspar. Besides, this locality is deservedly famous for its rock-cut temples and monoliths constructed by the Hindu monarchs of middle ages.

Table of Geological Formations, and associated

Age		Geological formations
.....		The Sea.
Recent	...	{ Alluvium (Nemer), Deltaic alluvium, Nemer raised beaches, coral banks.
	...	{ Cave deposits of Kurnool.
Pliocene	...	{ Alluvium (Older), Older Godavary alluvium, low-level laterite, raised beaches.
	...	{ Cuddalore sandstone.
Miocene	...	{ Laterite (High-level) of Ganjam, Palni and Nilgiri hills.
	...	{ Lateritoid deposits.
(Lower Miocene)	...	(Upper and Middle Miocene locally absent).
Oligocene	...	Cuddalore series on the east coast, and Warkalli beds on the west coast.
Eocene	...	(Locally absent).
Cretaceous.	{ Darian ..	{ Ninnyur Stage: Deccan trap, outlier at Rajahmundry. Aryalur stage.
	{ Cenomanian.	{ Trichinopoly stage.
	{ Weald ...	{ Utatur stage.

ARYAN GROUP.
(SIR T. H. HOLLAND).

Mineral deposits of the Madras Presidency.

Mineral deposits

Common salts

Monazite, ilmenite, zircon, garnet, and glass-sands, alluvial gold, brick clays and diamonds.

.....

Kankar, saltpetre, soda-earth, iron ores, lithomarge.

Building stones.

Building stones, iron ores, bauxite, lithomarge.

Manganese ore, iron ores, ochre.

.....

Building stones, lignite, alum shales, marcasite, and pyrrhotite.

.....

.....

Phosphatic nodules, gypsum, ochre, clays, shell-limestone, building stones (Basalt), agate, jasper, rock-crystal.

.....

.....

Table of Geological Formations, and associated Minerals

Age		Geological formations
ARYAN GROUP—(concl'd.) (SIR T. H. HOLLAND).	Jurassic	Portlandian. Tripetti, Pavalur beds.
		Bathonian. Raghavapuram, Sripermatpur beds.
		Lias ... Gollapalli, and Budavada stages.
	Triassic	... (Locally absent).
	Permian	... (Upper and lower Permian locally absent).
	Barakar stage	... Godavary valley.
DRAVIDIAN GROUP.	Permocar boniferous.	(Locally absent).
	Carboniferous	...
	Devorian	...
	Silurian	... (Locally absent).
	Ordovician	...
PURANA GROUP.	Cambrian	...
	Torridonian	... Kurnool series.
	Algonkian	... Cuddapah system.

Mineral deposits

.....

Different varieties of clay and shale.

.....

.....

.....

Coal, sandstone.

.....

.....

**Diamond, limestones, quartzites, shale, barytes, steatite,
argentiferous-lead-ore, manganese-ores.**

**Manganese ores (in part), quartzites, slates, argentiferous-
lead-ores, traps (building materials).**

Table of Geological Formations, and associated Mineral

Age	Geological formations
Archean system* ...	A. Younger pegmatite intrusions.
	B. Elæolite syenite series.
	C. Charnockites.
	D. Peridotite intrusions.
	E. Peninsular gneiss.
	F. Quartz-veins cutting schistose rocks.
	(Sedimentary ore-deposits).
	G. Kodurites.
	H. Khondalites.

* At the present state of our knowledge, the interrelation
any great degree of

deposits of the Madras Presidency—(concluded).

Mineral deposits

Mica, kaolin,*garnet, ilmenite, monazite, graphite, molybdenite, rare-minerals, gem-stones, (columbite, tantalite, aquamarine, monazite, cyrtolite, sipylite, zircon, thorianite, cordierite, ruby).

Corundum, spinel.

Building stones, road-metal, ilmenite, monazite, quartz-magnetite ores (confined to Mysore)

Chromite, magnesite, steatite, asbestos.

Building stones, corundum, kyanite, garnet and stawiolite.

Gold, silver, pyrites, pyrrhotite, arsenopyrite, blende, galena, chalcoppyrite, stibnite (dominantly found in Mysore, but extends to Anantapur in the north, and North Arcot in the south).

Quartz-iron-ores (in part), manganese ores (in part), manganeseiferous iron-ores, dolomite, manganeseiferous limestones and marble.

Manganese ores, lithomarge, ochre, apatite, graphite.

Graphite, garnet, building stones.

ships of the various formations touched upon, is not known with clearness, or accuracy.

THE AGRICULTURAL COLLEGE AND RESEARCH INSTITUTE, COIMBATORE

THE Agricultural College and Research Institute is situated three miles from the town of Coimbatore and about twenty-five miles from the foot of the Nilgiris. It is reached from Madras by one night's journey on the Mettupalaiyam Mail train.

The Institution comprises a Teaching College and a Research Institute with the necessary quarters for staff, hostel, playing grounds, etc., the Central Farm, and three Plant Breeding Stations, the total area occupied being about 557 acres.

TEACHING COLLEGE

This is now housed in a separate building, known as the Freeman Building, which was formally opened by His Excellency the Gover-

nor in 1926. This building contains a number of well-fitted laboratories, lecture rooms, etc., and is complete in itself.

The teaching college is affiliated with the Madras University and the course of instruction given is one of three 'years' duration, being a post-intermediate course in agriculture and the related sciences. The science subjects are taught as such but specially in their relation to agriculture. The course leads to a degree of B.Sc. AG. of the Madras University. Forty students a year are admitted and there is room for 120 students in all and the College is at present quite full.

Teaching has been entirely separated from research and is carried out by a number of Lecturers in the different subjects, viz., Chemistry, Botany, Agriculture, Zoology, Engineering, and Veterinary. The College and College Estate are under the administration of a Principal who is aided by a Vice-Principal who is also the Lecturer in Agriculture.

The research officers though not directly engaged in teaching are required to give a certain number of lectures each year to the students on

their own particular subjects and the research stations are, at all times, open to the students so that they can acquaint themselves with what is going on.

CENTRAL FARM

The Central Farm possesses an area of 232 acres of cultivable land which is mainly used for instructional purposes though some experimental work is also undertaken. A wide range of soils is represented including dry land, both black and red soils, garden land, and wet land. All the principal crops of the Presidency are grown and the students thus obtain practical experience in all the main types of cultivation. Special attention is paid to the practical side of the training and the students are obliged to work on the farm themselves and take part in all cultural operations while they also are provided with plots of their own which they are expected to cultivate. Practical agriculture is a failing subject in the degree examination.

Attached to the farm is an up-to-date dairy where practical dairying, butter making, etc., is

taught. A pedigree herd of cross-bred cattle is maintained at the farm for the purpose of supplying milk to the estate through this dairy. Research work on cattle breeding is carried out on three big cattle farms situated in other parts of the Presidency under a special Live Stock Officer. There is also a veterinary hospital where instruction in veterinary practice is given and also shops for carpentry and blacksmithy.

RESEARCH INSTITUTE

Investigations in the chief branches of science connected with agriculture are carried out by a number of research officers, comprising a chemist, a systematic botanist, an entomologist, a mycologist, and an agricultural engineer, while plant breeding work is done by a paddy specialist, a cotton specialist, and a millet specialist each of whom has a separate plant breeding station of his own.

The experimental work varies considerably from research on scientific problems of a fundamental nature to a study of the practical application of known scientific facts. In addition

there is a certain amount of routine work such as chemical analyses, seed germination tests, examination of materials sent in for report on insect and fungoid pests and in the botanical section for identification.

The following is a necessarily brief summary of the chief lines of work of the various sections :—

CHEMISTRY SECTION

The most important items of investigation in hand are—

- (a) Soil surveys.
- (b) Conservation of soil moisture.
- (c) The effect of manuring on crop and seed.
- (d) Synthetic farmyard manure.
- (e) Experiments with different manures both artificial and indigenous.

Attached to this section is a bacteriologist who is working mainly on problems connected with the solubility of rock phosphates and bacterial problems arising out of the investigation into the manufacture of synthetic farmyard

manure and the rapid decomposition of cellulose and lignin.

There is also an animal nutrition branch of this section in which problems relating to digestibility of different forms of fodder and standard diets are being investigated.

BOTANICAL SECTION

There is a very large herbarium at Coimbatore on which the Flora of Madras now being compiled at Kew is largely based. Studies are being made in this section of the weeds of cultivated land in the Presidency, of fodder grasses, and of medicinal plants.

•

ENTOMOLOGICAL SECTION

The present research work is confined almost entirely to a study of various pests. An Insectary is attached to the section for the study of the habits and life histories of such pests. Some of the major pests under investigation are paddy stem borer, *calcoris* of cholam, mango hopper, fruit flies, rice grasshoppers, thrips, and

hairy caterpillar. A campaign is being carried out on the biological control of *Nephantis serinopa* on the West Coast by means of its natural parasites.

MYCOLOGICAL SECTION

Investigation of the fungoid diseases of plants especially of economic crops and the devising of remedial measures form the main lines of work of this section. The following are some of the more prominent crop diseases which are under investigation at present :—

Piricularia of paddy, mosaic disease of sugarcane, *Vermicularia* of cotton, wilt diseases of betel vine, groundnuts, and plantains.

PLANT BREEDING SECTIONS

Paddy. Work is carried out on the paddy breeding station which occupies about thirty acres at Coimbatore, but this is supplemented by three other stations, one at Aduturai in the Tanjore-Trichinopoly delta, one at Marteru in Godavari delta, and one at Pattambi on the West Coast.

Improved strains are being raised by single plant selections from all the important varieties while good varieties are also crossed with a view to combining the good qualities of the parents selected for the purpose. These strains are tested in the field by means of a system of plots for which the experimental error has been accurately determined and also on the various Experiment Stations and finally given out to the ryots. Eight of such strains have been issued from Coimbatore and ten from Aduturai while the other two stations are comparatively new and have not yet reached the stage at which a new strain has been evolved.

In addition to this a large number of other problems are under investigation such as the effect of sowing at different seasons, different types of nursery, manurial trials, spacing, cultural treatment, etc. A study connected with the food value of rice has also been undertaken.

On the academic side work is being done at all these stations on inheritance characters and hybridisation is being undertaken. The most interesting phase of this work is the attempt

which is being made to evolve strains resistant to certain diseases.

Cotton. Work is carried out on the cotton breeding station at Coimbatore and on several subsidiary stations in the district., The main object is to produce better strains of cotton suited to different localities both by means of selection and hybridisation.

Some excellent strains of Cambodia have been evolved and these are now grown over very wide areas. Similarly some good strains of Karunganni have been evolved and issued.

Other problems which are under investigation are the best time to sow, manurial work, and cultural improvements.

Millets. A millets breeding station was established at Coimbatore in 1923 under a specialist and good progress has been made and the first of the improved strains which the station is designed to evolve are in sight.

Attention has so far been mainly concentrated on peria-manjal cholam and ragi and both the academic and economic aspects of both these crops are under intensive study. A satisfactory

start has also been made with korra, arika, panivaragu, and kuthiraivali.

Sugarcane. The work of this section is carried out on the Cane Breeding Station, which occupies about fifty-two acres. It is an all-India station started with the object of remedying India's comparatively low outturn per acre of cane. The bulk of India's cane acreage is found in North India and the indigenous canes of that area are in most urgent need of improvement; hence the chief attention of the station is concentrated on work for that area. New types are being raised by growing cane from seed, instead of from cuttings, and crosses are also being made between different varieties. The original difficulties have been overcome and seedlings are now being raised in large numbers.

Among special subjects being studied are :— The inheritance of characters in seedlings, the nature of the root-system and the fertility of the flower.

Over 300 varieties, collected in India and other countries, are being grown.

Other Crops. A great deal of research work

has been undertaken with other crops, but this is done on Experiment Stations situated in other places in the Presidency.

ENGINEERING SECTION

A Research Engineer has just been appointed with headquarters at Coimbatore. He will devote his attention entirely to research and at first the possibility of improved local implements will receive consideration. The different makes of ploughs, etc., now on the market will be critically examined and compared with the idea of discovering a few standard types and if necessary introducing improvements in the makes now available to render them more suitable to the needs of the ryot and different types of soil.

R. D. A.

SOME ANTHROPOLOGICAL PROBLEMS

SOUTH INDIA presents a large number of fascinating problems for the anthropological worker. In view of the facts that customs are changing so rapidly before the advance of education, and that some of the tribes like the Todas are fast becoming extinct, there is great need for trained workers who will record existing practices. Unfortunately, since the last session of the Science Congress in Madras no great advance has been made in the field. Recently, however, we have had Rao Bahadur L. K. Anantha Krishna Ayyar's *Anthropology of the Syrian Christians* and Mr. W. J. Hatch's study of the Kuruvus of the Tamil country under the title, *The Land Pirates of India*. The field is so vast and the problems so many that we deplore the dearth of workers.

The Castes and Tribes of Southern India by

Thurston and Rangachari and *The Castes and Tribes of Cochin* by Anantha Krishna Ayyar are valuable as surveys of the principal groups in these areas. Mr. Anantha Krishna Ayyar is placing us under a further debt of gratitude to him by a study of *The Castes and Tribes of Mysore* to be published shortly. If the Travancore Government could see its way to organize a survey in its area, it would complete the larger areas of the south. But in addition to these surveys there is great need for more detailed investigations into many of the individual social groups. As far as the south is concerned, Rivers on *The Todas*, and the two new works by Hatch and Anantha Krishna Ayyar are about the only specialized studies available. The pity of it is that there is little encouragement either from the Government or from the University. Until the University undertakes to train men who are able to conduct scientific work and thus create an interest, there is little chance for real progress.

One of the perpetually recurring problems has to do with the inter-relationship between Dravidian and Indo-European elements in South

Indian culture. The further the problem is investigated, the more complicated it seems to be. It has been assumed by many that South India in language and culture is fundamentally Dravidian, though Indo-European elements have been grafted on. The problem of disentangling the elements from one another is difficult. The truth is, we have no criterion by which to decide what a Dravidian element really is. It is not enough to follow a practice of elimination, and say that any elements in the south that do not appear in the north must therefore be Dravidian, for we know that Dravidian influence penetrated the north also, and further that other causes for differentiation are to be reckoned with, due, for example, to local conditions and events. When the Indo-European invaders entered India, probably by the Khyber Pass, they found at first rather sparsely settled areas. Later as they swept down through the Land of the Five Rivers into the Jumna-Ganges valley, they came into contact with inhabitants who disputed their right to proceed. The word 'Dravidian' is commonly used to describe these peoples, and it is

supposed that the pre-Aryan inhabitants of India in the north as well as the south were Dravidians. We should not forget that the term 'Dravidian' as employed ethnologically is no more than a convenient caption, for the more we find out about the Dravidians, the surer we are that they were themselves admixtures of various elements, including Scythian and Mongoloid and perhaps Negroid. The word 'Dravidian' is derived from an ethnic name *Draviḍa* or *Dramiḍa*, the Pali equivalent of which is *Damiḷa*, the affinity of which with the adjective *Tamiḷ* is apparent. 'An' ancient Tamilian tradition refers to the five Dravidian areas, *pañcha-draviḍam* by which is meant the Tamil, Andhra, Kanarese, Maharashtra and Gujerat regions. Naturally the invading Indo-Europeans took much more time to reach the south than the north, so that there is ground for believing that the south was a stronghold of Dravidian culture long after there had been a synthesis of the two elements in the north. In some instances there were conquests with an enslaving of the earlier inhabitants by the invaders, which is without doubt one of the

origins of the caste system, and is apparent in the fact that some of the lower castes show pronounced Dravidian characteristics, while the Indo-European ascendancy appears in the Brahmanical superiority.

If the tradition about a *pañcha-dravidam* be correct, there should be evidence in support of it both of linguistic and of ethnological types. Such evidence is not nearly as convincing as is ordinarily supposed. Ancient Sanskrit works refer to the Andhra country alongside of the Dravida, and distinct from it. In the time of the *Aitareya Brahmana* the Andhras alone appear to have been known to the Indo-European world. Philologists tell us that in all probability there was an undifferentiated mother-tongue from which the present Andhra and Tamil languages were derived. Kumarila speaks of the *Andhra-Dravida bhasha*. Sanskrit grammars do not refer to any Dravidian group of languages, though they speak of a *deshi* element in distinction from Sanskrit and Pali. The relation between the South Indian languages and the Aryan is one that requires further investigation. As they exist now,

certainly there is a large Aryan element in the southern languages in addition to the non-Aryan element. Some scholars are inclining to the view that the Aryan element in these languages is the original, and that it was later that the aboriginal elements became fused with the Aryan.

There is no gainsaying the fact that there were non-Aryan peoples in South India before the advent of the Aryans. That does not prove that the immediate predecessors of the last Aryan invaders were Dravidians. Several scholars have admitted that the ethnological evidence indicates that the South Indians of the present are much more closely akin to the Aryans than to any other types, Mongoloid, Scythian, Negroid, or what not. Thurston's conclusion is that generally speaking, 'the Dravidian type of head will even bear to be directly compared with the European. . . . The Dravidian heads differ from the English, only in being smaller and narrower with a preponderance in the former of the signs of timidity and subtlety, and in the latter of physical and moral courage.' The conclusions

reached from the standpoint of physical measurements seem to be that South Indian peoples are strongly Aryan. To be sure, there are other elements. The Andamanese islanders show Negroid tendencies, and the Vedda's of Ceylon, some of whom are to be found also in Travancore, show an Australoid strain. The only matter about which we can be certain at the present is that the problems are as complicated as the languages and the cultures.

Another of the vexed anthropological problems is concerned with the diffusion of customs and conventions. We know that both custom and convention are diffused through suggestion and imitation. Here in South India there are multitudes of such social usages that have been sanctioned through custom, and the origins of which are lost in obscurity. In some cases we find practices which affect many different communities, and in other cases those which are apparently local. There are some very interesting problems that await the research student as to the manner in which borrowing has taken place. Where we have relations between two or more communities who have

parallel customs, who was the borrower and who the lender? And under what circumstances did the diffusion take place? Doubtless the similarity between practices is to be explained sometimes on a psychological basis rather than historical.

A concrete illustration will make clear the type of problem to which reference is made. There is a number of interesting parallels between the Kallars, one of the so-called criminal tribes, and the Muhammadans of South India. In the first place circumcision is in vogue in both communities. Secondly, there is a certain amount of polygamy in both. Third, in both communities there is a custom for the bridegroom to go on horseback to the marriage. Fourth, girls are veiled for the marriage ceremony alike in both. Fifth, Kallar girls wear a crescent shaped pendant, suggestive of the Muslim symbol. Sixth, in both communities girls wear black beads. Seventh, there is a custom among Kallars of addressing Muhammadans as 'grandfather,' 'uncle,' or some such term of kinship to which the Muhammadan replies with appropriate terms, as 'grandson,'

'nephew,' etc. Among the Kallars themselves there are two theories as to these parallels, one that they adopted them from their Muhammadan conquerors, the other that both owe the customs to a common source. This is one of the problems relating to diffusion of culture of which there are many, awaiting the investigator.

The various rituals and ceremonials of the religious life further illustrate the problems arising from culture contacts. There is a line of cleavage between two types of religion in South India that is obvious to the observer. On the one hand there is the Brahmanical cult with its associations with literary Hinduism, and to some extent with philosophic Hinduism. But the masses of the people follow a religion that has little more than nominal affinities with the Brahmanic cult. In the villages there are innumerable minor deities who are propitiated in numerous ways to obtain their favour and guard against their caprices. Most of these deities are of local origin as well as one can tell, and are propitiated by bloody sacrifices in which all but Brahmans participate. In fact the very word *grama devata* signifies that the

people regard them as of local origin or function. Most of these minor deities are female, and myths associate them in various ways with the major deities of Hinduism. Some of the female deities are regarded as the *saktis* of the great gods, and in a general sense the term *sakti* is popularly applied to all of these minor goddesses. Other cults have arisen through the veneration of people who while living performed some acts regarded as especially meritorious, or are regarded as having made post-mortem visitations for the benefit or otherwise of the living. Many folk-tales gather around the local deities and their shrines, most of which presumably have a factual basis but suffer from much accretion.

It has been common to speak of these minor deities and their cults as Dravidian. It is exceedingly hazardous to venture how much or how little is of Dravidian origin, since we know so little about Dravidian culture in general. But it seems pretty certain that these local cults represent a social consciousness that characterized the predecessors of the present inhabitants, and probably point back to a period antecedent

to Brahman dominance. We have two studies of this subject, Bishop Whitehead's *The Village Gods of South India*, and Dr. Elmore's *The Dravidian Gods in Modern Hinduism*. Dr. Elmore's study is clearly the more careful of the two, and yet we can scarcely deny that even his title begs the question. At the same time the different interpretations of these students of the subject are an indication of how unworked the field yet is. Dr. Whitehead conjectures that the buffalo-sacrifice in the cult of the *grama devatas* is a relic of totemism, while Dr. Elmore interprets it as symbolizing the dire punishment and humiliation of a conquered enemy. We certainly need to know more about the subject before we can take sides with either writer with any certainty. Dr. Whitehead's hypothesis itself raises another vast problem, viz., the evidence for totemism in South India, a problem which so far has enjoyed nothing more than sporadic attention from students of anthropology.

On the technological side there are many problems also which await the investigation of the scientific worker. Scarcely any excavations

have been conducted in any part of the south though undoubtedly light would be thrown on periods of ancient history and pre-history if such were the case. The Archaeological Department always has the very sufficient reason of 'no funds' with which to carry on extensive work. Even on the surface technology presents problems. Within a few miles of Madras neolithic remains have been found on the surface of the ground in the form of chipped stone utensils, such as lamps. In many parts of South India there are megalithic remains, dolmens and stone-circles the origin and function of which are matters of dispute. Some suppose them to be burial-chambers, while others regard them as places of shelters from inclement weather or wild beasts. A few iron weapons and implements found on excavation lead some to identify these chambers with the Iron Age. Human bones have been found in Travancore dolmens. But we know that the terms 'Iron Age' and 'Stone Age' are very relative. In parts of Assam and in the Ceded Districts of the Madras Presidency stone burial chambers very similar to these dolmens are still

in use. The origin of South Indian dolmens and stone circles is still a problem.

Another set of problems gathers around the mythology current in South India. Puranic literature is a veritable mine of folk-lore, and South India shares with the other parts in this. In addition there are numerous myths associated with the local cults and local communities. One group of stories is popularly known as *The Shepherds' Purana*, and comprises legends current among the shepherds, a distinctly South Indian community. These legends are regarded as of comparatively recent origin, though they are written on palm-leaf books and zealously guarded. The cults and deities to which reference is made in the shepherd legends are not associated with the major gods of Hinduism. In addition we have many legends which are of obvious local origin, being designed to add a sanction to the cult of the *grama devatas*. In some cases such legends are grafted on to Puranic legends, and the story-tellers recount a version of the Puranic tale enlarged sufficiently to afford a place for the local cult, and to connect the deity with

Hinduism proper. This side of folk-lore in South India is practically virgin soil for the investigator.

It need scarcely be pointed out that these problems are inter-related in many respects. Language, social organization, social customs, technology, folk-lore and religion are all parts of a cultural unity, of distinctive interest yet integrally related. Almost any problem that is investigated is sure to throw light on several other kindred matters. To the anthropologist South India constitutes a challenge.

A. S. W.

THE KING INSTITUTE OF PREVENTIVE MEDICINE

THE King Institute is situated at Guindy about seven miles from Madras. It was founded in 1903 and named after Colonel W. G. King, C.I.E., I.M.S., then Sanitary Commissioner of Madras, who was chiefly responsible for its inception. At first its main work was that of supplying vaccine lymph to the Madras Presidency, but in course of time its activities have extended very greatly and at present it serves as follows :—

For the whole Presidency—

- (1) The only vaccine lymph depot.
- (2) The main general bacteriological laboratory for bacteriological and serological diagnostic purposes.
- (3) The laboratory for the manufacture of all vaccines except plague, and of sterile solutions and culture media.

- (4) The only Government Public Health Laboratory for the bacteriological and chemical examination of water supplies, milk, food, etc., and now includes the laboratory for the Public Analyst to the Government of Madras.
- (5) A cold storage and distributing centre for sera for human and veterinary use.
- (6) A general clinical and public health research laboratory and the centre for three mobile investigation units.

For all the Madras hospitals except the General Hospital—

- (7) The clinical bacteriological laboratory—an Institute car collects material daily.

The Institute covers several acres of ground and consists of a main building for the bacteriological and chemical work, a new subsidiary block for vaccine lymph work and many out-buildings for calves, animals, stores and offices. The Institute has its own water and gas supply.

runs a large cold store and makes its own ice. In the grounds of the Institute there are a set of experimental water filters with storage tanks and sand and mechanical filters.

The staff consists of a Director, two Assistant Directors, the Public Analyst who has powers as an Assistant Director, seven Assistant Surgeons, two non-medical gazetted Senior Bacteriological and Chemical Assistants, one Sub-Assistant Surgeon and five Junior Bacteriological, Chemical and Vaccine Assistants. In addition there is a large staff of laboratory attendants and other subordinates which swell the total staff to 178.

The Vaccine Lymph Section manufactures over two million doses of glycerinated lymph annually. The adoption of Nijland's cycle in 1922, has produced a lymph that has increased in potency every year, and was at its highest last year judging by the general case success rate for the Presidency which was 96·9 per cent.

The climatic conditions contended with in this Presidency are such that it has been found advisable to cease all routine vaccination

operations in the hottest months of the year April to July.

The General Bacteriological Section has been of increasing use to the Presidency and particularly so in the performance of Wassermann tests of which 16,000 were done in 1927-1928, and in the manufacture of stock and autogenous vaccines. From June 1927 to September 1928, owing to heavy demands, 1,560,000 doses of cholera vaccine have been manufactured and 1,344,000 have been issued.

In the Public Health Section the examination and investigation of water supplies has always been a prominent feature. During the course of each year, samples of water from every protected water supply, whether belonging to municipalities, railways, or jails, are collected by the Institute sample-takers, brought to the Institute and examined. Samples from any proposed source of supply are also submitted for opinion and report.

Experiments are being carried out with experimental filters at the Institute and at Kilpauk, under the direction of the Committee on Water and Sewage Purification,

of which the Director of the Institute is the Secretary.

The Public Analyst has fixed standards for certain food supplies with a view to bringing the Madras Adulteration of Food and Drugs Act into operation. In addition to his own work he controls the Public Health Section.

The work done by the MOBILE INVESTIGATION UNITS, the first of their kind to be formed in India, have justified their existence—the annual report for 1926-27 gives a good idea of their activities which extended over fourteen different 'malarial surveys and bacteriological researches.

The King Institute has a good record of MEDICAL RESEARCH WORK done by officers while working on its staff. The Protozoological researches of Captain (now Lt.-Col.) Christophers while Director are well known.

Medical Entomology has formed a very fruitful field for research in the hands of Majors Patton and Cragg, who worked in collaboration at the Institute for some considerable time. The experience gained by these officers

culminated in the publication of their well-known text-book on Medical Entomology.

The Institute was the head-quarters of the Kala-azar Commission in Madras in 1912.

The interest which has always been taken in problems connected with water purification originated with the work done by Major (now Lt.-Col.) Clemesha while Sanitary Commissioner in Madras. The results of his researches on tropical standards of purity were published in many of the reports issued from the Institute, and formed the subject-matter of his book on 'Water Supplies in the Tropics.'

The field covered in recent years has been a wide one and includes investigations into vaccine lymph, filariasis, kala-azar, relapsing fever, malaria, dysentery, cholera, puerperal sepsis and the purification of water. The results of these investigations by the members of the staff have been published from time to time in Indian Medical Journals and in the Annual Reports of the Institute.

In addition to its official work, the King Institute has taken a prominent part in the Health Propaganda Movement in the Madras

Presidency. Members of the staff have been responsible for the production of much material utilized by the Madras Health Council.

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H. H. K.

MEDICAL EDUCATION IN THE MADRAS PRESIDENCY FROM 1835 TO 1928

THE author of this article has in his possession records handed to him by the late Principal, Lt.-Col. Elwes, which give a very clear account of the rise and progress of the Madras Medical College and medical education in this Presidency up to the year 1885. In these documents it is noted that medical education in this Presidency started in 1835. A Medical School was established in Madras by the Rt. Hon'ble Sir Frederick Adam, K.C.B., by a general order of Government, dated February 13, 1835. The school adjoined the quarters of the Surgeon of the General Hospital. The Medical School was built in 1836 at a cost of Rs. 19,861-3-3 and was opened for work in July. It consisted of four apartments, a theatre or lecture room, a library, a museum,

and a laboratory, and a building behind the theatre for the purpose of conducting dissections or preparing parts for demonstration in the Theatre. The establishment of this Medical School was to be intended for the training of medical subordinates which was an epoch in the annals of the department. It placed in the hands of the profession a power to advance medicine hitherto unattainable.

It raised the status of the subordinates to such a high degree, that there was no comparison between the man who passed through its portals and his senior who had not this advantage. The first class which was taken in July 1835 consisted of ten medical apprentices and eleven native medical pupils. All were stipended. Private students were admitted later on. These private students and Government students were given a free education.

The teaching staff consisted of Surgeon Mortimer, M.D., as Superintendent of the Medical School, Assistant Surgeon George Harding as Assistant Superintendent. There were two Assistants, one a Warrant Officer, and the other a Dresser.

Control of the Medical School was vested in the Medical Board. Anatomy and Materia Medica were taught in the first year, medicine and surgery in the second year. The exigencies of the service, however, seldom or 'never permitted students for years after the opening of the Institution to complete their two years' course of study. They were absorbed into the service according to their position in the class register whether they completed their course or not. Government and private students were absorbed into Government service after about eighteen months of studying. The text-books used in the school were Mortimer's *Abbreviated Notes on Anatomy*, Thompson's *Conspectus*, Gregory's *Medicine*, Cooper's *Surgery*. It is satisfactory to note that even from the birth of the Medical College the importance of clinical work was recognized.

The first anniversary of the Medical School went off with great *eclat*.

The Rt. Hon'ble Lord Elphinstone presided and inspected the school. The Rt. Hon'ble the Governor expressed himself highly gratified with the results of the examinations. It is

stated that 'the momentum of the onward march of improvements' was given by other more powerful influences and other more popular institutions. The idea had begun to dawn on the minds of the authorities that an institution like the Medical School had a higher mission to fulfil than that of manufacturing subordinates for the medical service. In 1838 a set of draft regulations for the admission of private students to the Medical School was publicly notified. From 1835 to 1845 there were 219 apprentices, 201 pupils—total 420 in the eleven years. At first the opening of the school to private pupils was only taken advantage of to a very little extent. In eight years only ten private students came forward and only four remained for a year upwards. The reason for this small number appears to be the very precarious prospects of acquiring a livelihood in medical practice after qualifying.

The second decade was quite a contrast to the one that preceded it, for important changes in the right direction which were progressive in character occurred in quick succession.

In 1846, the Chair of Chemistry was sanctioned. In 1847 the entrance examination became more stringent, a more perfect knowledge of English was required. Two additional professorships were sanctioned—one, Professor of Midwifery and Diseases of Women and Children, and the other of Ophthalmology. Dr. Thomson was the first to hold this appointment. The school staff at this stage consisted of the Professor of Anatomy and Bacteriology, Professor of Chemistry and Materia Medica, Professor of Surgery and Medicine, and the Professor of Midwifery and Ophthalmology.

In 1847 the course consisted of a five years' one, and was reduced to a four years' course later. To the successful batch of students who passed out in 1852, the College, for the first time, granted its diploma of graduate of the Madras Medical College, a privilege which was enjoyed for fifteen years when it became merged into the degrees of the Madras University. Dr. Mortimer was in charge of medical education up to 1841. Dr. James Shaw was appointed the first Principal of the Medical College and appeared to control Medical edu-

cation from 1841 to 1862 in the Medical College. From 1862 onwards students in the third year attended the practice of the 'Lying-in-Hospital' and attendance also at the Eye Infirmary. ; Up to 1878 the practice of medicine did not attract the Brahmin student and the Medical College suffered as it was deprived of its quota of students from a community famous for its culture and intellectual superiority.

The Convocation Address of the Madras University was given by the Principal of the College in 1878 in which he stated that he failed to see any increase in the number of candidates for degrees in medicine. He stated in twenty years the Faculty of Medicine had produced three Doctors, half a dozen Bachelors and one Licentiate in Medicine out of a population of some 50,000,000 and he noted that the Brahmins have particularly held altogether aloof from the medical profession. From 1850 clinical instruction was regarded as one of the most essential branches of medical and surgical education, and students received their clinical instructions in the General Hospital, in the Eye

Infirmary and in the Maternity Hospital to which students were posted.

In 1885, it is stated, that the method of clinical instruction in vogue in 1850 still remained in practice. In 1850 it was considered intrinsically sound and perfect and no attempt was made in 1885 to improve on it. In 1850 the Medical School was accorded the higher distinction of a College and this change in the designation of the institution added to its professional status. From 1850 to 1858 medical education was under the control of a President of the Medical College, nominated by Government, and a Council consisting of Professors of whom one was appointed to act as Secretary.

The more important events of the College education were that the Professor of Chemistry became also the Chemical Examiner, and the Professor of Botany was also in charge of Materia Medica.

Application was made in 1852 to the Hon'ble Court of Directors for the admission of the Madras Medical College to the privileges accorded by the Royal College of Surgeons of England to Colonial Schools of Medicine. The

College was recognized as a teaching school only in 1855-56 by the Royal College of Surgeons, London.

Edinburgh, Glasgow, Dublin and Aberdeen were applied to for recognition. The medical education in 1855 was placed under the supervision of the Director of Public Instruction. This at the time was considered a great mistake as medical education was to lose the supervision exercised by a body of the most experienced medical officers of the department, a duty that was always honestly and thoroughly carried out by them. It was some years after handed over to the Surgeon-General.

In 1855-56 several students of the College distinguished themselves at Medical Schools in Great Britain. In 1856-57 the Inspector of General Hospitals presided over a Committee of medical officers consisting of three other medical men. This Committee formed a Board of Examiners in Medicine.

The examinations were conducted by the professors in the presence of the Committee. The members of the Committee occasionally put the candidates questions. The Committee

furnished the Director of Public Instruction with a full report. In their report of the examination, they remarked on the course of instruction given, and on other points which the results of the examination might suggest. It was reported by the Committee that only a few of the class seemed to be well-acquainted with practical medicine and chemistry. There was a complete failure in chemistry which the Committee attributed to the method of examining adopted by the Professors of Chemistry. The Committee then re-examined the candidates themselves with the result that the candidates were stated to have acquitted themselves more satisfactorily. The Committee also recommended the complete reorganization of the governing body of the College. 'Each Professor' they observe, 'acts independently and according to his own zeal and industry as his own sense and duty prompts him.'

The Director of Public Instruction agreed with the Committee that the powers and responsibilities of the President of the Medical College should be increased.

In 1857-58 on account of the Mutiny, the

courses of medical education were considerably cut down and most of the students were sent out of the College as Dressers in their second year, those in the fourth year as Assistant Apothecaries.

In 1858 a Principal was appointed to control the College. The appointment of President was abolished. Youths of fifteen years old who had been admitted to the College were now refused. No student was admitted under the age of seventeen by order of Government. The Principal appears to have doubted the advisability of this order and the professors of the College were unanimous as to the advisability of reverting to a system of a preliminary hospital training before the student entered the College. They were of opinion that after a student had two years in a hospital, before they entered College, their character was better formed, became well-disposed for College instruction and would always benefit more by it than they would ever do if they had not had the advantage of preliminary hospital training.

As the growth of education in all its departments increased, the necessity for

enlarging the College building was realized. In 1864, additions and alterations were made. Pathological and Materia Medica Museums were added and a new Theatre for the Anatomical Department was built about this time. The Pathological Museum gradually underwent expansion and in 1868 a museum with a thousand specimens was available for clinical instruction. The Anatomical Department received wax models from Dublin and London and a nucleus for a Comparative Anatomy Museum was started.

A Library for medical students consisting of 187 volumes was available from 1863-64 and in 1867 a general library containing 2,696 volumes and a students' library in which 384 volumes were available. In 1871 there appears to have been a Madras Medical Society which handed over its Library to the Medical College, Madras. They also handed over a sum of money Rs. 1,500, the annual interest accruing thereon was to be spent for the upkeep of the library. In 1872 the library numbered 4,572 books.

The chronicles of this period would not be

complete without reference to the vast tutorial power of the Medical College and efforts were made to turn out a much larger body of moderately competent practitioners, so as to place medical aid, within easy reach of the village population of this country. Two schemes were put forward,—Lord Napier's scheme, and Surgeon-General Balfour's scheme. According to Lord Napier's scheme, 4,000 village doctors would be required to meet the wants of this presidency and the question arose, how these 4,000 were to be educated in medical science. It was decided by Dr. George Smith, to whom the matter was referred, that thirty-three to thirty-five pupils was the largest number that could be efficiently taught at one time in the Medical College. It was therefore proposed that five provincial schools be formed, two in the Telugu, two in the Tamil and one in the Malayalam district, that each school was to turn out eight to ten village doctors yearly, that a course of instruction extending over three years should be given in vernaculars, that admission to these schools should be restricted to Vythians and their sons, that the Government pay of village doctors

should be Rs. 10 for the first five years, Rs. 12 for the next five years and Rs. 15 for the remainder of their service and eight annas house rent per month. It is stated that the senior department of the college had proved a failure. This was attributable to the want of an outlet for young men trained in it, that the staff of the professors maintained at the college was not necessary for the teaching of doctors for the mofussil. Two professors and two assistants could quite easily teach what was necessary for those medical men who would be in charge of the mofussil dispensaries, that the village doctor could be trained in two years, that a two years' course should be started for these village practitioners. This seems to have fallen through and small Medical Schools at Dindigul, Nellore and Tanjore were started for training the village doctors.

From 1860 to 1872 medical education took a distinct step forward, and it was divided into three distinct departments thrown open to all, irrespective of creed, colour or caste. Instruction for the Degrees in Medicine was distinct from the Apothecary class and the Apothecary

class was kept distinct from the Hospital Assistants Class.

In 1863, the Faculty of Medicine, Madras University, which had been in existence some years, claimed the exclusive right to grant degrees, and all who wished to obtain degrees must pass through the University. Preliminary standards were raised, better educated youths were encouraged to join the medical profession.

From 1872 candidates who obtained the Degree of M.B.C.M. were required to have graduated in Arts before receiving the degree of M.D. Medical education in this presidency continued to steadily improve, the reputation of the Madras Medical College rose steadily, former students were successfully competing for degrees and diplomas in England, and for commissions in His Majesty's British and Indian medical service.

In 1870 the Faculty of the University of Edinburgh agreed to recognize the teaching and courses at the Madras Medical College and agreed that candidates for degrees in medicine would be allowed to pass two of the four *Anni Medici* required by the Edinburgh regulations.

It is quite clear that the reason for the unpopularity of the study of medicine before 1872 was clearly the want of sufficient outlets, the only outlet at the time being the Indian Commission Medical Service which was opened to Indians just as it was to English candidates ; but the expense of going to England, and the uncertainty of being successful in the competitive examinations, made it a very serious consideration and many of the students possessed neither the means nor the inclination to go to England and compete.

In 1875 Government sanctioned the admission of lady students to qualify for the Degrees of the Madras University or for the College diploma. The University of Madras instituted the degree of Licentiate of Medicine and Surgery. In 1875 the requirements were less exacting than the M.B. and corresponded to an L.M.S. degree given in Calcutta and Bombay. The L.M.S. degree has been recently abolished.

In 1877 education in the M.B. class became greatly restricted by order of Government. The object was to take a much larger number of students to the service of Apothecaries and

Hospital Assistants, but it was interesting to note that there was no restriction made on ladies who wished to apply for medical education. However, the order of Government was not to remain long in force. A meeting of the inhabitants of Madras under the presidency of the late Hon. J. G. Coleman was convened and a memorial, dated September 15, 1877 asked Government for reconsideration of their order. The memorialists expressed themselves ready to pay for the education hitherto given gratuitously. The memorial appeared to have been successful in 1878. Registration fees and College fees were levied—the student for the M.B. course paying Rs. 600 and for the college course Rs. 400. These fees included all collegiate, hospital, and clinical instruction required by the University of Madras for the medical degrees.

1878 marks an epoch in the history of medical education. Four ladies passed out from the Medical College entitling them to practise various branches of the profession. Since 1880 the final examinations for students in the Apothecaries and Hospital Assistants class

have been conducted by a Board of Examiners specially appointed for the purpose. This was a great improvement on the old Examining Board as examiners from outside the college were appointed in addition to the professors who taught. In 1880-81 there appears to have been a complete revision of the classes, reorganization in the Anatomy Department, and in Surgery, Physiology, Midwifery, Materia Medica and Jurisprudence. This appears to have been due to recommendations made by the University. Dental Surgery was taught in 1883. Mr. Gould was the first Professor of Dental Surgery. In 1882-83 the Hospital Assistants class ceased to be trained at the Medical College and they were transferred to Royapuram Auxiliary Medical School. This was brought about in consequence of the candidates of this department generally lacking those educational advantages which would enable them to follow the lectures given by the Professors, for the University and Apothecary courses. In 1883 students were required to undergo practical instruction in vaccination. In 1883 attention was placed on the physical develop-

ment of the students. A Boat Club was started and out-door games. A Reading Club was also started to which fifty students subscribed Rs. 96. Professional journals and newspapers were taken in and a common room in the College seems to have been started.

In 1883 the Government of the Straits Settlements sent students to the college to be trained and paid Rs. 400 for the course.

The college which was originally built in 1836, considerably enlarged in 1867, was found in 1883 not to be nearly large enough. It was decided that a hygiene department and new dissecting rooms and lecture rooms were necessary. Several scholarships and prizes were conferred in this college. His Highness the Maharajah of Travancore founded the Bharati Lakshmi scholarships by endowing the college with the amount of Rs. 6,000 to be held by a woman who was qualifying for the medical degree. In this year, Mrs. Scharlieb, a former student in this college passed with high honours the M.B. degree of the London University. She took the highest place in the first class in Obstetric medicine and obtained the gold medal

of the London University. The education of women in India in the medical profession was started in Madras. The Principals of the Calcutta and Bombay hospitals wrote to the Principal, Madras Medical College, regarding the female classes in this college. They wished to know whether any difficulties were experienced in conducting their education. The Principal appears to have advised Calcutta and Bombay to start classes in their Medical Colleges for ladies. In 1884 there were 182 students studying in the Medical College. It is interesting to note the various numbers at this period. There were seventy-nine Europeans and Eurasians, twenty-five Brahmins, forty-seven Sudras, two Parsees, three Mohammedans and twenty-six Indian Christians. The Europeans formed three-fifths of the total attendance. The presence of so many Brahmins indicated a 'great decline of the prejudice of the high class of Hindus to the exercise of the art of healing'. This is in some way due to the Convocation address of Surgeon-General Fernell in which he brought forth convincing arguments to upset their deep-rooted prejudices. Young Moham-

medan gentlemen do not appear to have come forward very freely to study medicine. The total receipts of the college fees of 1878-79 down to 1884 was Rs. 58,695-10-2 and the expenditure during the same period Rs. 3,83,717-8-7.

Dr. Robert Cole who once held the appointment of Principal Inspector of Hospitals, contributed a very useful article in the *Journal of Literature and Science*, volume vii, on the Madras Medical School. He considered the introduction of a systematic plan of education in medicine as carried out in the Medical College, Madras, as the most important stage that had yet been accomplished in the mental improvement of the people in Southern India.

In 1885 the fiftieth anniversary of medical education at the college was celebrated, Brigadier Surgeon Keess reading a very full report. There were 215 students in the college—amongst these were eleven lady students under training. Each Professor appears to have made a report which was read at the annual meeting. Professor Branfoot reported that 'the conduct of this class in college has been good, but, while at the Lying-in-Hospital several of these

students were wanting in proper discipline and respect to constituted authority'.

The Principal stated in his report that the students' clubs were working satisfactorily and helped to maintain a very desirable *esprit de corps* amongst the students and moreover they decidedly contributed to lessen the tendency to the formation of clique based on nationality and general religion. The report goes on to state that after fifty years 1,523 students have passed out as medical subordinates for the service of Government, thirty-four have become graduates of this college, thirty-eight have taken University Degrees, thirty-two have been partially educated here and left for further training in Europe making a total of 1,647. He states in his report that those responsible for development and progress in the college were aware that there was need for further advancement to keep it abreast of modern progress and if possible in the forefront of kindred schools in Great Britain and elsewhere. Government apparently agreed with him and sanctioned a sum of Rs. 75,000 to improve the Medical College and provide a Physiological Laboratory, a museum and a

laboratory for Hygiene. It was recognized that the science of preventive medicine was justly reckoned in all civilized countries as one of the most important in the domain of medicine. The Principal appealed to the public saying, 'I would fain hope that the time is not far distant when wealthy philanthropists will see their way to instituting research scholarships which will encourage scientific investigations and enable highly trained medical graduates of our Universities to spend a portion of their career in prosecuting enquiries in the wide field of causation and treatment of morbid states, and in their practice, testing the value of the numerous indigenous drugs which are reputed to be efficacious in the treatment of disease.'

The Professors during the first fifty years of medical education in Madras who left their mark, were Professors Mortimer and Hæding, Directors of Medical Education in the college, Dr. Keess, Professor of Chemistry, Dr. Blackloch, skilled clinical teacher in medicine, Dr. Chipperfield, Anatomist and Physiologist, Dr. Shaw, the most popular Physician and Surgeon at the time; Dr. Smith whose energies were

devoted to the advancement of medical education, Dr. Evans, a sound and thoughtful physician and teacher ; Dr. Mayer, a great teacher of Chemistry, Dr. Listin Paul, an able teacher ; Dr. Harris, leading Gynaecologist and Obstetrician in Madras who was the first to be appointed to the Government 'Lying-in-Hospital', Dr. Fernell, who is associated with the discovery of chloroform, Dr. Henry King who succeeded Fernell as Principal and Dr. Price.

The history of medical education in this presidency up to 1885 shows that it was highly successful as far as it went. 'It must be remembered in 1858 the great Virchow lived and in 1862 Pasteur and Lister were making their discoveries. Medicine was advancing rapidly and becoming highly scientific. The history of medical education in Madras during the last forty-three years has been one continuous progress.

I think all will agree with me that officers of the Indian Medical Service have been chiefly responsible for the teaching and progress of medical education in this presidency. The future of medical education will continue to prosper, and

will be in the hands of the Provincial Medical Service and private practitioners, and a handful of I.M.S. officers. The Professors who have controlled the teaching of the various departments from 1835 to 1928 have put their heart and soul into the work.

The Medical College and the Madras University are now associated with the teaching of medicine in degrees with another University—the Andhra University with its Medical College at Vizagapatam. The Medical Schools at Tanjore, Royapuram, Vizagapatam, and Calicut, the Lady Willingdon Medical School, Madras and the Medical School at Coimbatore undertake teaching for the Sub-Assistant Surgeon Class. University medical education is confined to the Andhra and Madras Universities, each of which gives their own degrees. At present they hold a joint examination. There are proposals for having separate examinations. The Medical College still issues a diploma but this diploma will soon become defunct. The Medical Schools still grant the diploma to the Sub-Assistant Surgeon after an examination held by a Board appointed by Government.

This diploma of Sub-Assistant Surgeon will probably be abolished and a State qualification be substituted after a five years' course. It is interesting to note that the Madras University have always striven to keep their regulations and standard of examinations up-to-date. Between 1910 and 1928 the regulations have been changed seven times. During the last year, 1927, the regulations were brought up-to-date to conform with the requirements of the General Medical Council of Great Britain.

The departments of Hygiene, Pathology, Biology, Pharmacology, Physiology, have all been brought up-to-date, as far as possible. New buildings are about to be erected and will make the Medical College, Madras, one of the best in the East. Great improvements in the hospitals attached to the Colleges and Schools are also under construction. This will assist greatly in improving and bringing up-to-date, clinical teaching. Those who were responsible for medical education and have left a reputation in this Presidency during the last 43 years were : Branfoot, Maitland, Brown, Donovan, Giffard, Elliot, Niblock, Symons, Rama Rao,

Kirkpatrick, and Elwes. All were great clinical teachers in their special subjects.

Madras is especially fortunate in having two of the finest hospitals in the East, namely, the Ophthalmic Hospital and the Women and Children's Hospital. Both these institutions are the envy of all who appreciate the value of unlimited clinical material for teaching in Ophthalmology, Obstetrics and Gynaecology. Probably in no other hospitals in the East or in Europe, is such abundant clinical material available. The whole question of the formation of a teaching cadre and the teaching of specialists to fill the vacancies in the colleges and schools is now under the consideration of Government. Special departments for Children's, skin, throat and venereal diseases and tuberculosis, have all been started. The most up-to-date Pathological, Bacteriological and Biochemical and Hygiene Institutes will be erected shortly at the Medical College, Madras. This will assist to keep the teaching up-to-date, and advance the science of medicine in this country. The spirit of research, keenness, and advancement, appears to be in the minds of all, and I

have no doubt that, with this spirit prevailing, advancement of medical education in the future will continue as it has done in the past. Much could be written about the improvements which have taken place from 1885 to 1910, and from 1910 to 1928. It is gratifying to know that all the recommendations recently made by the General Medical Council to bring the Madras University courses up to the standard required by the General Medical Council have been carried out.

This Presidency is very fortunate in having for the last five years a Governor, His Excellency Lord Goschen, who was for many years Chairman of Guy's Hospital and so is familiar with medical education and clinical teaching in hospitals. Under the advice of the Surgeon-Generals, the Ministers have brought about, greatly to the benefit of medical education, great changes during the last five years in the teaching by the appointment of the whole-time Professors ; great efforts are now being made to improve the General Hospital and the various departments in the Medical College. We have now in the Medical College over 650 students.

in the various departments. Over 500 of them are studying for medical degrees. There are 71 lady students.

In one year now, as many graduates pass out from the University in Medicine, as passed out in the first fifty years of the life of medical education in this Presidency. When I say that 23 new appointments have been made in the college during the last three years, it will be understood that every department is expanding rapidly and carrying out the necessary teaching required now-a-days. The advance of medicine, surgery and midwifery is conditioned by contemporary progress in every branch of science, and their virtue lies in the number and vigour of their allies. Biology, Physiology, Radiology, Biochemistry, Bacteriology, Physiology, and Pharmacology are all well-equipped departments under whole-time Professors, and Pathology will shortly be so. With their efficient aid, the Physician and Surgeon can do his best for his patient and keep his teaching up-to-date. The future progress of medicine in this Presidency depends on the efficiency of its medical colleges and schools.

We do not know what situation will be created in the future. Therefore, those associated with medical educational problems should prepare the rising generation to meet a change in any unknown directions in the future. We realize in Madras that, to be taught in an efficient and well-equipped Medical College, working under skilled Clinicians and College Professors, is the best way to turn out scientific medical men who will advance the progress of medicine and medical education in this country.

C. A. F. H.

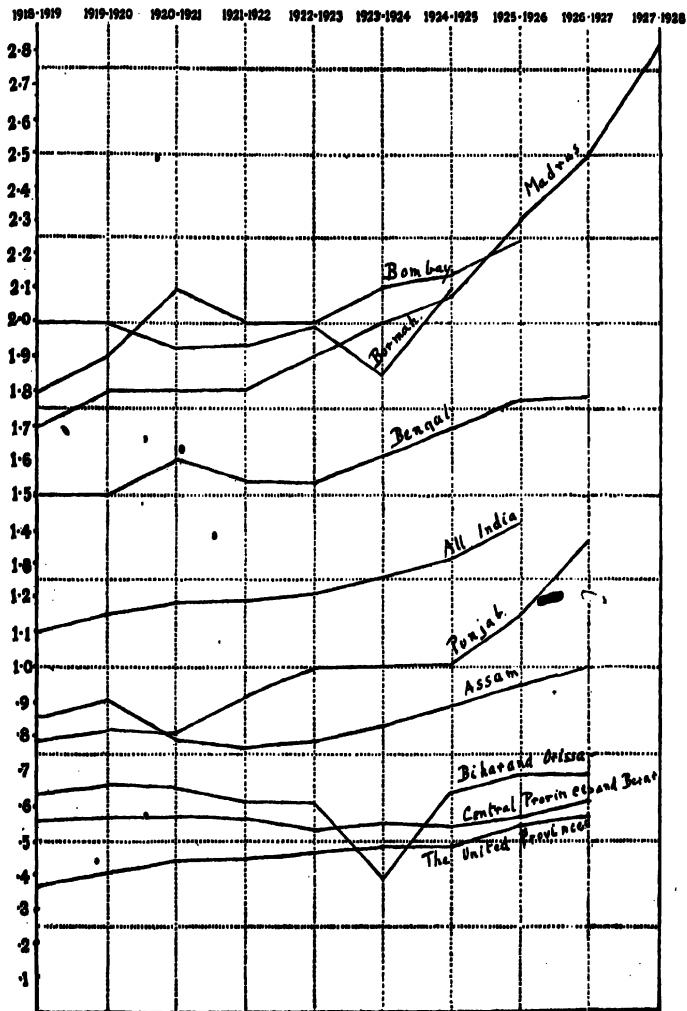
WOMEN'S EDUCATION IN MADRAS

WOMEN'S education in this presidency is considered to be more advanced than in many other parts of India. A statement of the position which will show how far this assumption is justified may perhaps be of interest.

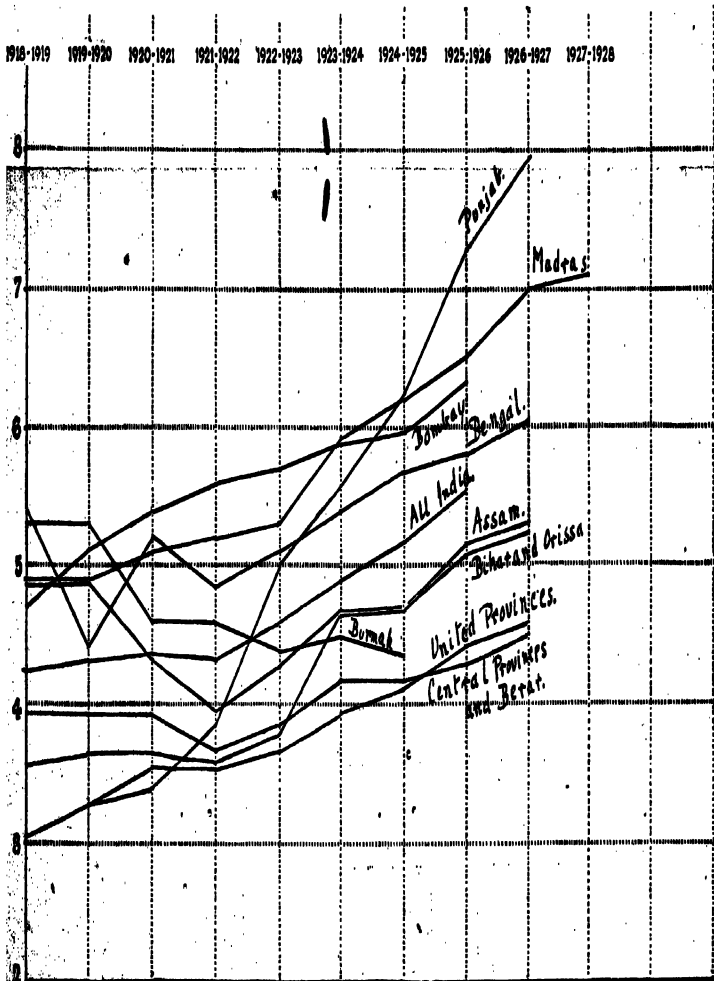
In appendix I a graph is given which shows the percentage of the female population in public institutions in all India and in the larger provinces during the last nine years. Figures for Burmah after the year 1924-25 and for Bombay after 1925-26 are not readily available and the graphs cannot be completed for those provinces while that for Madras only can be completed for the year 1927-28. This diagram shows that Madras during the last decade has been one of the four provinces in which the percentage of the female population reading in public educational institutions has been above that for all India, but, that until the

year 1923 both in Bombay and Burmah the percentage of the female population attending schools and colleges was greater than in Madras. It was not until 1925 that Madras surpassed Bombay in this respect but in 1926-27 it was 2·5 per cent and ahead of all the other provinces. This position has not however been maintained. While the actual figure for Burmah is not available it has now surpassed the Madras Presidency and the percentage of female population in public institutions in that province is higher than in any other province in India. It will however be seen that with the exception of the years 1920-21 and 1921-22, which was a time of acute financial stringency the percentage of the female population under instruction has risen steadily and with increasing rapidity especially in the latter years of the period. From this point of view the progress in the development of the education of women and girls in the Madras Presidency during the last decade must be considered satisfactory but that it has been surpassed by Burmah.

One of the most unsatisfactory elements in the progress of education in India is the marked



APPENDIX I.



and growing disparity between the stages reached in the progress of education for girls and boys. Development in girls' education even if marked and steady cannot be considered satisfactory so long as it continues to lag behind that of boys. Appendix II shows the disparity between girls' and boys' education during the same period, i.e., 1918-19 to 1926-27. From this it will be seen that there is only one province in India, the Punjab, in which the disparity between the education of the two sexes is greater than in Madras. In this respect the position in Burmah appears to be more satisfactory than in any other part of India. In this province alone is the disparity less at the end of the period than at the beginning and further the diagram shows that with the exception of the year 1923-24 the decrease has been continuous throughout. This is however due to a decrease in the percentage of the male population in schools and not to a specially satisfactory condition of girls' education. Between 1918-19 and 1925-26 the percentage of the female population in schools in Burmah only increased by 9 per cent. Figures for

1927-28 are available only for Madras but these show that as a result of these special efforts that have been made, which include the subsidizing by Government of 500 new elementary schools for girls during the year 1927-28 and the opening of more training classes for women, the rate of increase in the disparity between the percentage of the male and female population in schools and colleges is less than it has been at any time during the last ten years. In Madras the extent of the disparity is not due to any slackening in the rate of development in girls' education but rather to the very concentrated efforts which have been made successfully, to extend education among boys as rapidly as possible. In the Punjab this is not the only factor that has affected the rate of increase of the disparity. The rate of increase in the percentage of the female population at school in this province is less between the end of the official years 1924-25 and 1925-26 than in the years immediately preceding and this accentuates the rate of increase in disparity.

Turning to a comparison of the proportion of the female population in each of the provinces

which is reading in colleges and high schools, we find that in 1924-25 (the latest year for which figures are available for all the larger provinces) that 31 out of every 100,000 female inhabitants are undergoing University education in Bombay, in the Punjab the corresponding figure is 8, while in Madras and Burmah only 2 out of every 100,000 women are receiving a University education. For Bengal the corresponding figure is 1. The total number of women students reading in colleges in Madras was 477 and was larger than in any other province. In Madras also there were more colleges intended solely for women, there being five such colleges. In Bombay and Burmah there were no women's colleges at that time. The differences shown in this respect are due to the fact that *pardah* is not observed among a considerable section of the community in Bombay and that hence the women of the provinces have been able to attend the men's colleges and have not been dependent on the institution of special colleges for women. In the Madras Presidency and the Punjab where the custom of observing *pardah* is more widely spread the

institution of women's colleges has enabled them to make progress equal to or in excess of that of the other provinces. In the Punjab there were two women's colleges in 1924-25.

In the same year in Burmah 154 members of the female population out of every 100,000 were attending secondary schools. In Bombay the corresponding figure was 95, in Madras 57, in Bengal 35, in the Punjab 29 and in Assam 28. In this respect Madras stands third in the list and is surpassed by Burmah and Bombay. The difference between Burmah and Bombay and Madras is again partly a question of social custom, the habit of early marriage among the Hindu community which forms, approximately 89 per cent of the total population makes the development of secondary education exceptionally difficult. Madras was also much less well provided with secondary schools than were the other two provinces. In Madras there were approximately 2·7 secondary schools per million female inhabitants, in Bombay there were 5 and in Burmah 8.

Since 1924-25 the position in Madras has only improved slightly in regard to the per-

centage of girls in colleges and secondary schools. In the year 1927-28 the number of women in colleges rose to 2·4 per 100,000 female inhabitants and in secondary schools to 65 per 100,000 female inhabitants and Madras is thus still behind the position reached by the Punjab and Bombay in University education for girls in 1924-25 and behind Bombay and Burmah in secondary education in that year. The number of high schools has only increased by 2 since 1924-25.

Madras has thus been surpassed by one or more provinces in all points, in the percentage of female population attending educational institutions, in the decrease in disparity between the education of boys and girls, the percentage of the female population which is reading in colleges and secondary schools and in the provision of secondary schools per million of the female population. Madras has however a much larger problem to tackle than Bombay, the Punjab or Burmah where the female population is 9·4, 8·8 and 5·9 millions respectively. (The figures are from the census of 1921.) Madras however surpasses in all these

points the larger provinces of Bengal, the United Provinces and Bihar and Orissa all of which are more comparable with Madras in the size of population. Madras has approximately 21 million female inhabitants, Bengal and the United Provinces 22 and Bihar and Orissa 17.

The chief difficulty that has stood in the way of the development of women's education has been the indifference and in some sections of the community, even hostility, to the education of girls and a consequent shortage of women teachers. This difficulty is now rapidly disappearing and there is an increasing demand from all classes of the community for better educational facilities for girls and where these have been provided during the last two years a very good response has been made. There are also indications that a rapidly increasing number of women are ready to take up the teaching profession if adequate facilities for training them are provided. Seven new training classes for women were opened in July 1928 and the number of new students admitted into these schools was 147.

Another fact which very seriously hampers the development of women's education, especially of the secondary and collegiate grades, is the custom of early marriage in the Hindu community, and the observation of *purdah* by the Muslim women. Among the Christian communities which are not hampered by either of these customs 11 per cent of the female population is attending public educational institutions. Of the Muslim female population 5 per cent were in schools and colleges during the year 1927-28 while among the Hindu women and girls only 2 per cent were receiving education. In the Madras Presidency it is the Hindu section of the community, which represents approximately 89 per cent of the whole female population, which is most backward in the matter of girls' education. There were however in that year 31 per million of the Hindu female population receiving secondary education in Forms IV to VI while the corresponding figure for the Muslim community is only 19. In colleges there are 10 Hindu women per million Hindu women and 4 Muslim women per million Muslim women. The measure of educational

progress cannot be made with reference to the percentage of the female population receiving education alone. Progress can only be considered as satisfactory when a proportionate development in all three grades,—primary, secondary and university—is shown and in this respect the education of Muslim women is less advanced than that of Hindu women. One of the most unsatisfactory features of education in India as a whole, both for boys and girls, is the high percentage of pupils who are reading in the two lowest classes and who do not succeed in becoming permanently literate. 'In' Madras on March 31, 1928, 79 per cent of the girls attending school were reading in Classes I and II and of these 62 per cent were in Class I. While in the initial stages of progress in the development of elementary education for girls the numbers in Class I will be inflated, since all pupils coming forward for education must start in Class I. The percentage of girl pupils in Classes I and II has risen from 75 per cent on March 31, 1927 to 79 on March 31, 1928, and is a fact which merits very serious consideration.

In the city of Madras the Corporation has introduced free, compulsory elementary education for all non-Muslim girls in certain wards and is now extending the scheme to include the whole of the city. On March 31, 1928, there were 91 elementary schools for girls.

Secondary education for girls in the city is fairly well developed but suffers in comparison with that for boys from the fact that, with one exception, there are no secondary schools other than Government and mission aided institutions. On March 31, 1928, there were 3 secondary grade schools under Government control, one being the only secondary school for Muslim girls in the presidency ; 8 under mission management including the home educational classes where pupils are given instruction in their own homes and which is the only organization of this type in the presidency ; and one non-mission aided high school. For boys there are approximately the same number of schools under public bodies and missions but there are 15 high schools under non-mission aided managements. One of the greatest needs at present in the development

of girls' education is for public spirited citizens or organizations to come forward and do for the girls what has already been done for boys in the way of assisting other agencies in making provision for the education of girls.

Two very interesting institutions have recently been opened under non-mission aided management which are designed to provide for the needs of adult women who, because they have become widows in later life or for other reasons, are desirous of taking up a profession and of becoming self-supporting, but who have not had a sufficient education in their youth to qualify them to enter courses of training which will fit them for professional careers. One of these institutions is in Mylapore and is under the control of the Madras Seva Sadan. In addition to providing classes in general education this school specializes in giving instruction to adults in various kinds of industrial work and handicrafts. The other which is situated in Triplicane, is also of special interest in that it is entirely organized and managed by Indian women and is under the control of the Sri Sarada Ladies' Union. This institution besides

holding general educational classes has also opened training classes for Indian women teachers in July 1928. It is the first training school for women in the presidency to be run by a non-mission aided management. All other training classes for women are either under Government or mission control.

There are now 48 training schools for mistresses in the presidency including the two colleges in Madras which provide training courses for graduates. Besides these two training colleges, the Lady Willingdon Training College under Government management and St. Christopher's College under mission management, the Sri Sarada Ladies' Union Training School and two Government training schools provided training facilities for women of the secondary and elementary grades in the city.

Another institution of special interest is the Ice House Hostel attached to the Lady Willingdon Training College which was started to provide education for child widows with a view to providing these girls with a means of becoming self-supporting and independent and

of supplying girls' schools with a supply of women teachers who, since they would be free from the cares of wifhood and motherhood, would be able to devote their whole time to professional work. The establishment of this institution has been fully justified by the number of teachers of all grades and of nurses and women doctors who have been trained in the institution and many of whom are now holding posts of considerable responsibility.

The higher education of women is provided for in Madras city by the two first grade colleges for women, the Women's Christian College under mission management and Queen Mary's College which is under Government control. These colleges provide a wide choice of University courses although neither college has as yet made any provision for honours work. These colleges are staffed almost entirely with women and are thus available to all Indian women including *gosha* women. It is due largely to the establishment and satisfactory development of these colleges that there is now a good and increasing supply of well-qualified Indian women graduates which will make

possible a widespread development of women's education in this presidency. It has also made possible the organization of an efficient and growing inspectorate for the supervision of girls' schools. •There are at present 5 Inspectresses and 37 Assistant and Sub-Assistant Inspectresses so that every girls' school in the presidency, however remote, is now inspected by a woman officer.

A class, which although still in its infancy is of considerable importance, is the physical training class for teachers in schools for Indian girls which was opened in July 1928 to train specialists in physical education for appointment in training schools for mistresses and in secondary schools for girls. This class is attached to the Lady Willingdon Training College.

The position of girls' education in this presidency is thus full of promise, there is a real and growing desire for the expansion of girls' education among the general public, the problem of the provision of teachers seems to be now largely a matter of increased training facilities and there is a relatively good and

growing supply of graduate teachers to staff the training and secondary schools that are needed and to expand the women's inspectorate to keep pace with the increase in number of the schools for girls.

I. H. L.

THE PRESENT STATUS OF PSYCHOLOGY

PSYCHOLOGY is progressing steadily in the direction of science. In modern times the general direction of development is away from metaphysical domination towards scientific freedom. It has been changing its habitation from the academy to the laboratory, and shifting its friendship from metaphysics to biology. It recognizes no method other than the scientific, and asks no recognition from others for conclusions that will not stand scientific tests. ●

It is of no small significance that the psychologists of India are meeting annually as a branch of the Indian Science Congress rather than as a section of the Indian Philosophical Congress. It indicates that India is aligning herself psychologically with the general trend of development everywhere. It is a fair question to inquire on what grounds psychology

may claim the right to be considered a science, for we may as well acknowledge that there are some who grudge us this much consideration.

A science is defined in the *New Oxford Dictionary* as 'the body of what is accurately known on each subject.' It is the pursuit of systematic and formulated knowledge, and the principles regulating such pursuit. The aim of psychology is to formulate and systematize all the accurate knowledge available concerning the mental life. In so far as it is useful for that end it makes use of quantitative methods, and subjects its accumulated data to statistical treatment. But there is no objective criterion available or possible by which it can be determined beforehand what accuracy is. Even within the sphere of the physical sciences revised formulations are constantly necessary as accuracy grows. In the biological sciences, to which psychology may claim allegiance, the element of life is a much more difficult factor to confine within quantitative limits than anything else. Mechanical facts lend themselves to a mechanical kind of accuracy ; vital facts must be described with equal accuracy even though they

be less mechanical. May we not say that accuracy of description means describing phenomena as objectively as possible? Admitting that some fields of investigation are more difficult than others to overcome all subjectivity, we know that scientists are human beings and that subjective elements cannot be eliminated completely from any science. We claim then that psychology is just as determined as the physical sciences to construct a body of accurate knowledge with the data with which it is particularly concerned.

Psychology may claim to be ranked with the scientific disciplines because of its adoption of the scientific method. The point of differentiation between what constitutes science and what does not is far more a matter of method than of content. The subject-matter of the various sciences is of many different and unrelated kinds. The physical, natural, social, and logical sciences have nothing in common as far as subject-matter is concerned, which could be erected into a criterion for determining a science. The respects in which they resemble one another is the classification of facts, the recogni-

tion of their sequence and relative significance, and the habit of forming judgments based upon these facts, personal feeling being eliminated from such judgments. From the seventeenth century onwards induction has been practically synonymous with scientific method, though its effectiveness has vastly increased through the use of the hypothesis and the trial and error method for testing the same. In respect of method, psychology may claim the right to be called a science. In the field of the mental life it is making use of observation, experiment, classification, statistical treatment, and recognizing sequences and relative significance of data. In South India these tendencies are not as well developed as in some parts of the scientific world. But we are faced in the right direction. The University of Mysore gave a good lead and its laboratory is steadily progressing. The Andhra University has this year (1928) sent a man abroad for special training in Experimental Psychology. And the Alma Mater of the other universities, the University of Madras, seems disposed to begin laboratory work in the near future.

The existence of a laboratory in a given subject is not by any means a guarantee that the scientific method prevails in that field. The recognition of psychology as a science depends more than anything else upon the temper of the men who are engaged in the investigations of the subject. A science is the work that is carried on by men of the scientific temper. That means that psychology may claim to be scientific in so far as her students and teachers have eliminated themselves and their feelings, and are devoting themselves dispassionately to the tasks of observation, experiment and classification of the data of the mental life. It means also that the other sciences have to come to psychology for the only possible basis on which to define and differentiate scientific from other disciplines. In the last analysis a scientist is a scientist, not because of external accretions of any sort whatever, but because of his mental make-up. To the extent that there are being developed in South India men of scientific acumen, absolutely devoted to the search for the truth about the mental life, determined to allow no pre-judgements to warp their judgements, to

that extent may we claim that psychology is developing scientifically. For no science, chemistry, geology, psychology, or anything else, has any existence apart from the men who are giving their lives to the investigation of its problems. If we look over the scientific world to-day we submit that from this most important point of view, the right of psychology to be ranked as a science stands indisputable.

Psychology lays no claim to have finished with the method of trial and error, and to have arrived at final conclusions. In regard to many matters we are in the hypothesis stage, and within our own ranks are men who hold widely differing hypotheses in regard to some subjects. There are the behaviourists who seem to think that they are not being scientific unless they have reduced psychology to physiology, while their opponents are quite as convinced that it would be unscientific to rule out consciousness. It is quite conceivable that the future of psychology lies in a synthesis of the methods employed and points of view expressed by what are to-day regarded as different schools. The neurological-psychologist, the behaviourist, the mental-

tester, the psychoanalyst, the introspectionist, and the Gestalt psychologist each has a contribution to make. The mental life is exceedingly complex, and includes vital facts as well as mechanical, motives as well as chemical processes, aspirations as well as biological habits, social data as well as personal. The technique by which all this data is to be examined must be adaptable enough to deal with all the multiplicity that appears.

The psychologists of to-day are following the typical scientific procedure of investigating particular problems. It requires actual, concrete problems to stimulate scientific work. The field of each science is delimited by the definite group of phenomena which it seeks to explain. It adds to its knowledge of that field a bit at a time by facing the problems at hand individually. Its tools and its techniques are instruments to help in its problem-solving operations. There is a great variety of students using the instruments of psychology to attack special problems, and, the field of its application is constantly growing wider. The social scientist, the anthropologist, the student of animal behaviour,

the educationalist, the economist, the criminologist, the psychopathologist, the moralist, the student of religion and others are all discovering in psychology a method and a technique invaluable for the investigation of particular problems within their respective fields. There is a vast field awaiting the patient investigations of a host of psychologists here in South India. There are matters economic, religious, social, political, educational, etc., to which students of the future will increasingly apply psychological methods. The task of to-day is to train men to use psychological instruments scientifically to aid in the solution of some of the urgent problems with which we are now confronted.

A. S. W.



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